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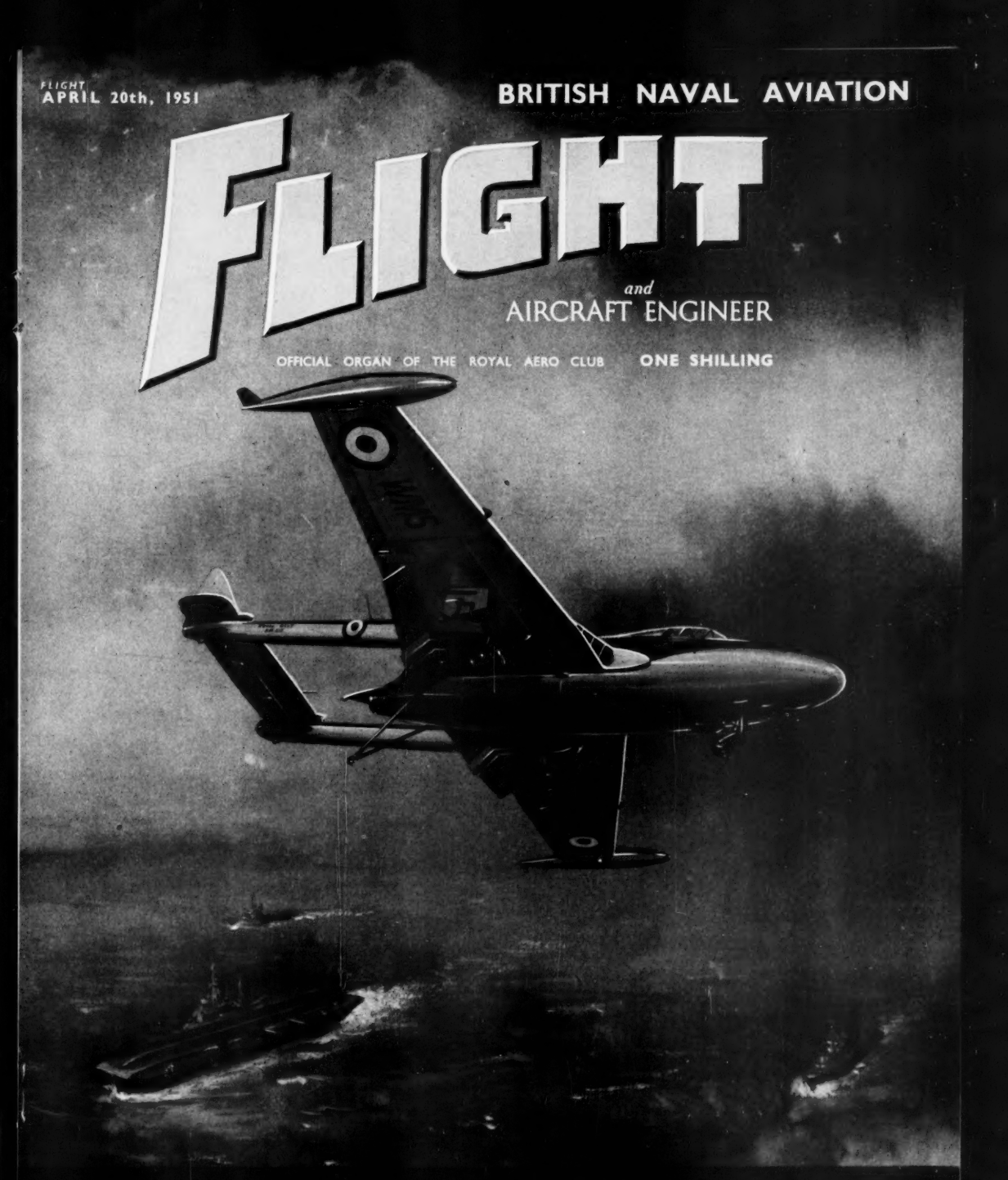

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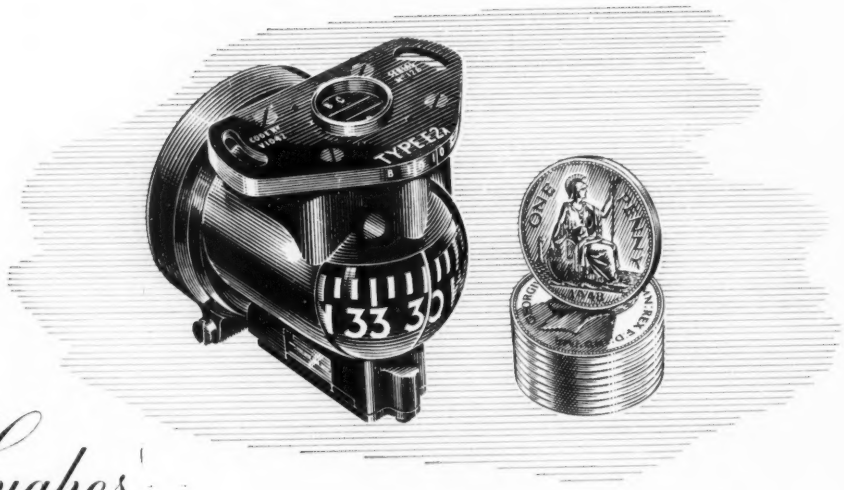

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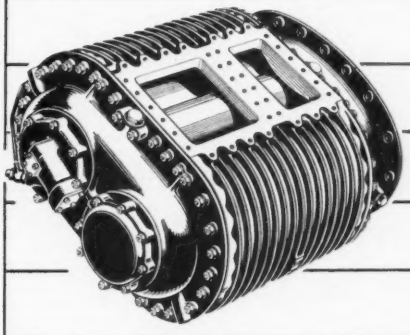

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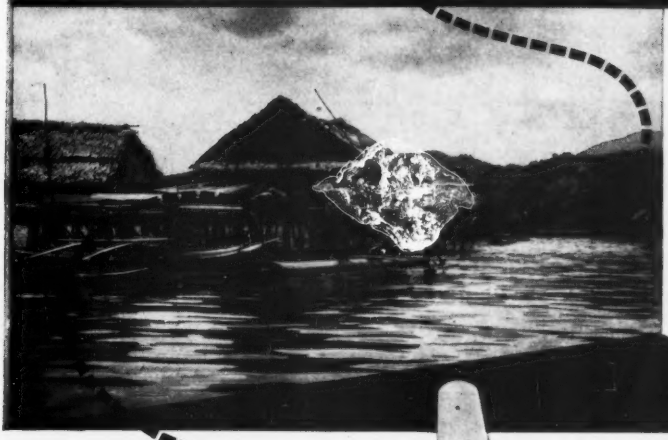

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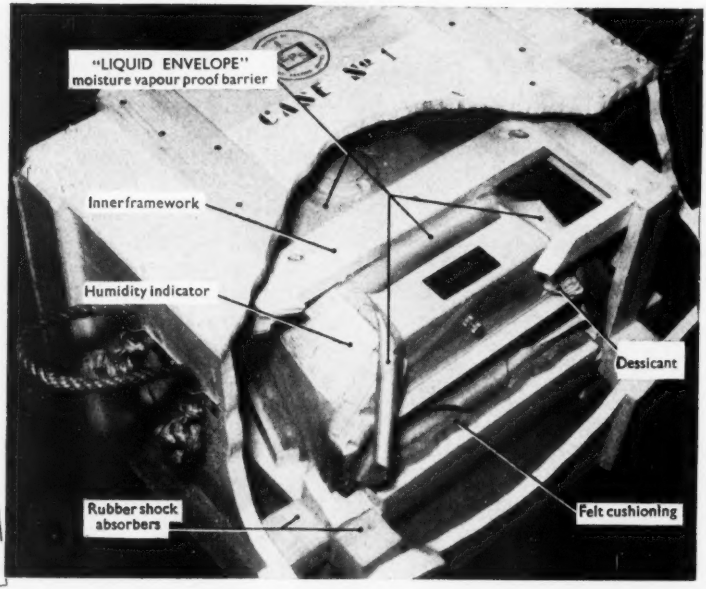

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RESEARCH

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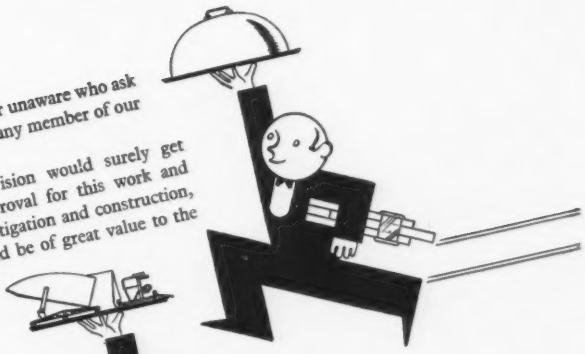

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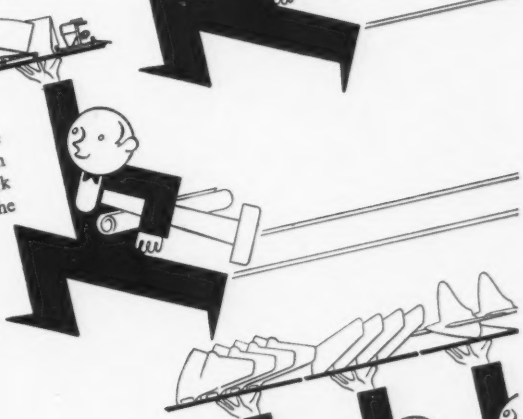

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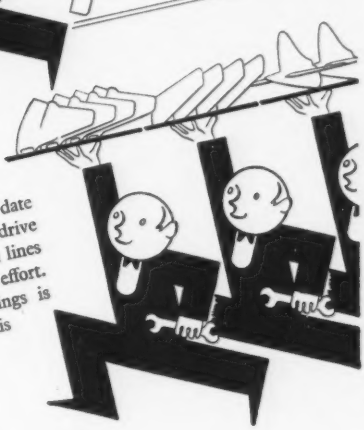

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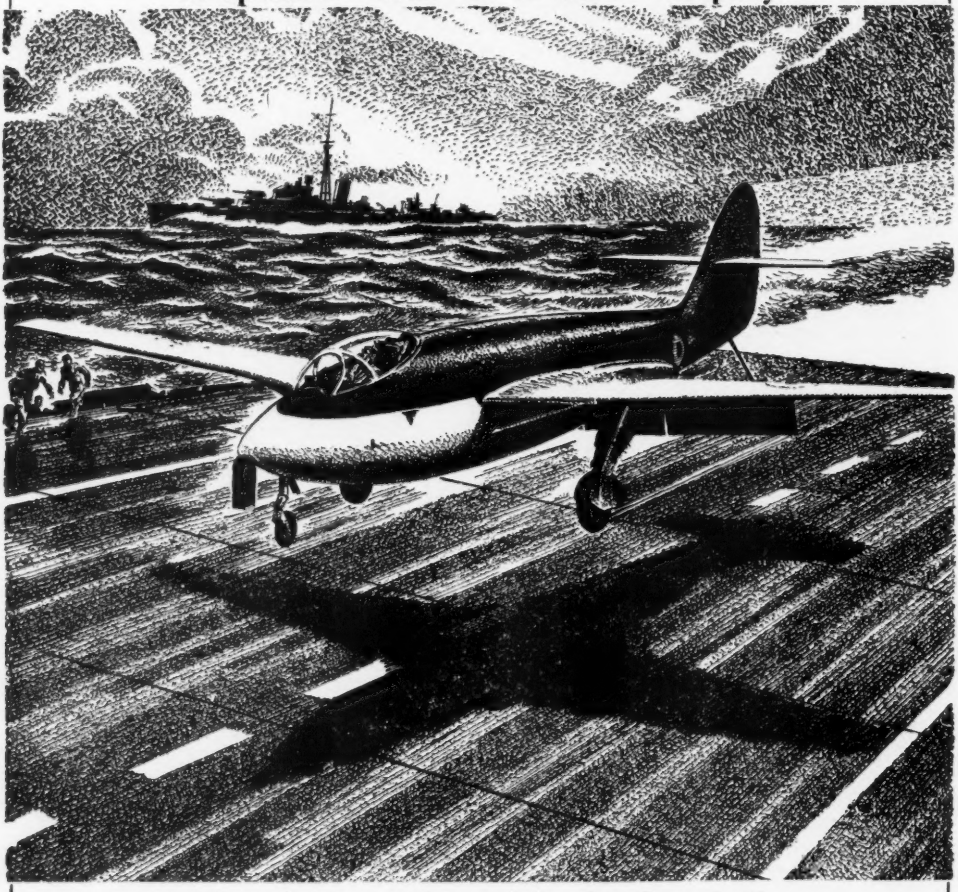

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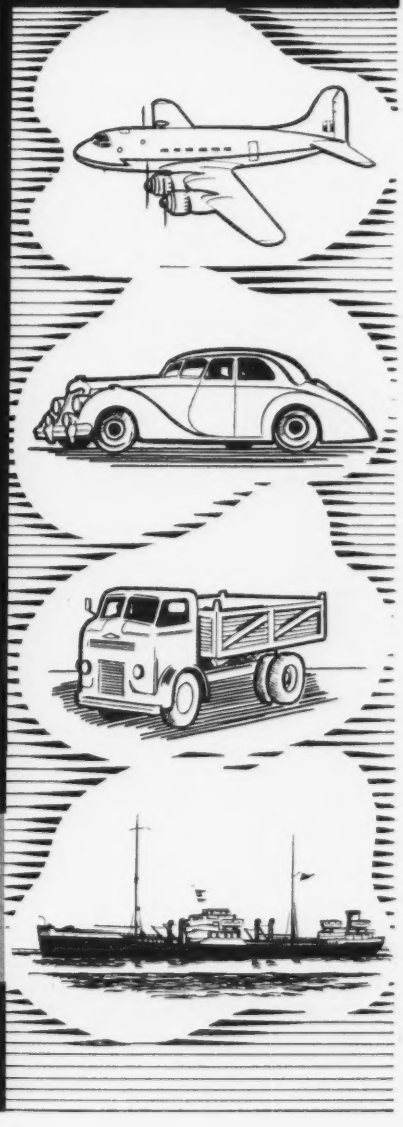

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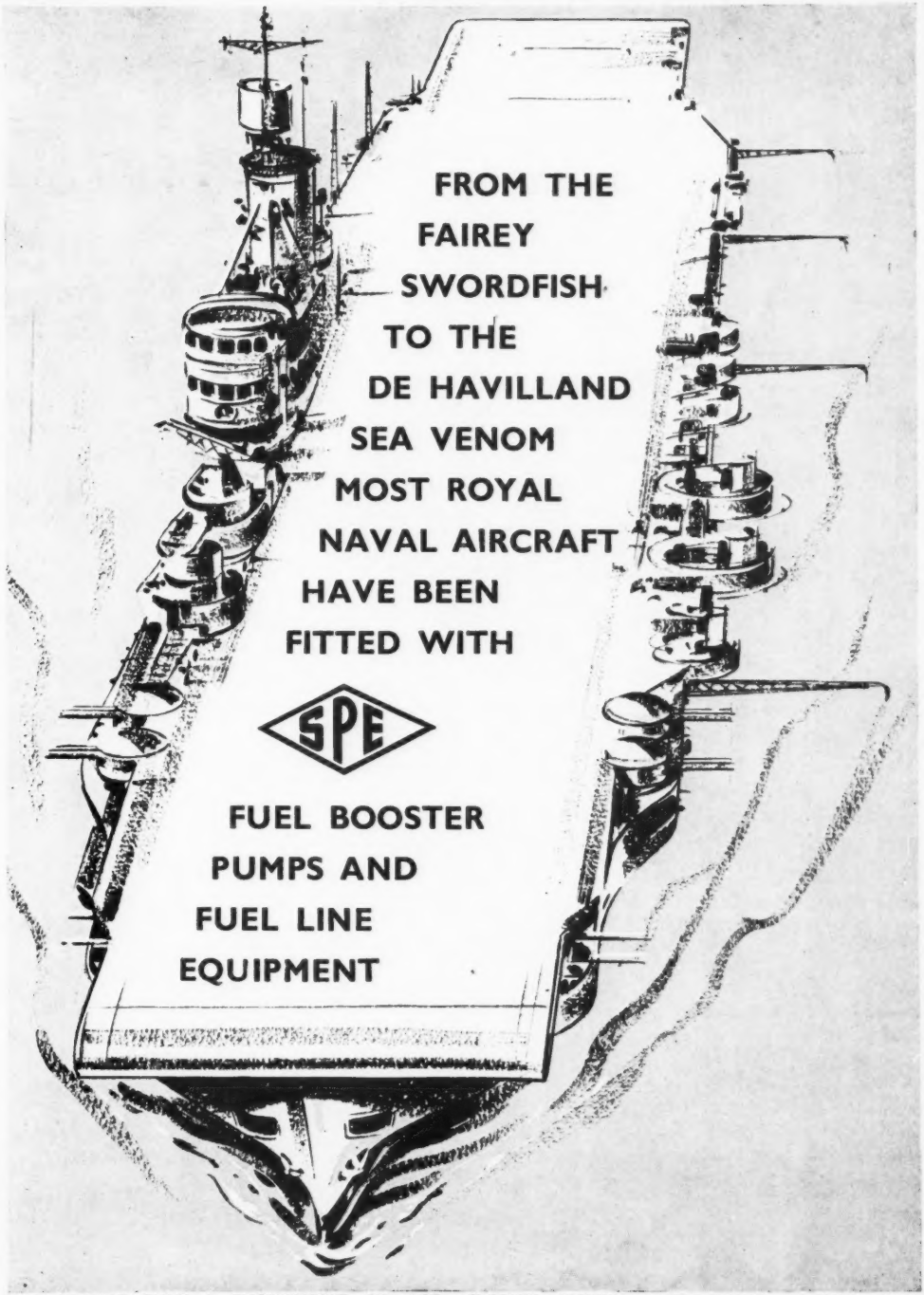

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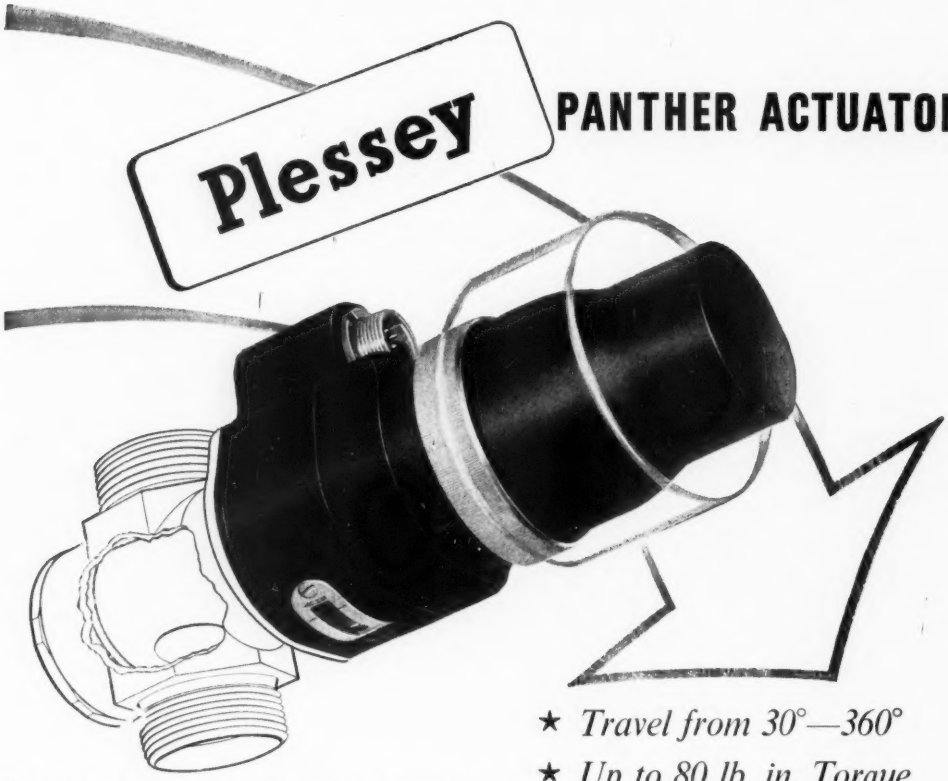

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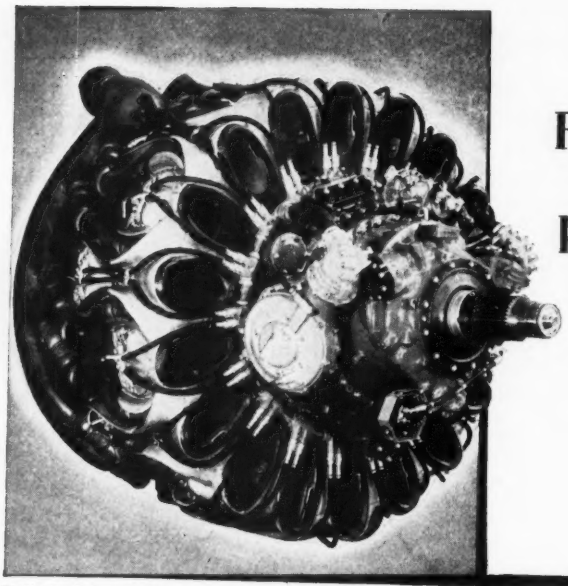

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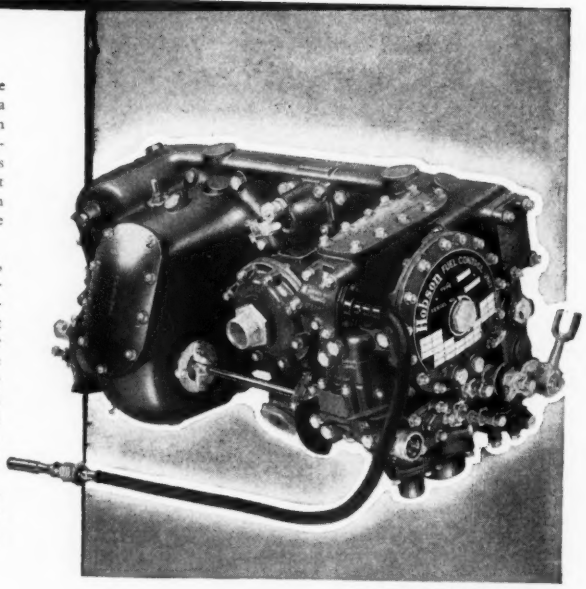

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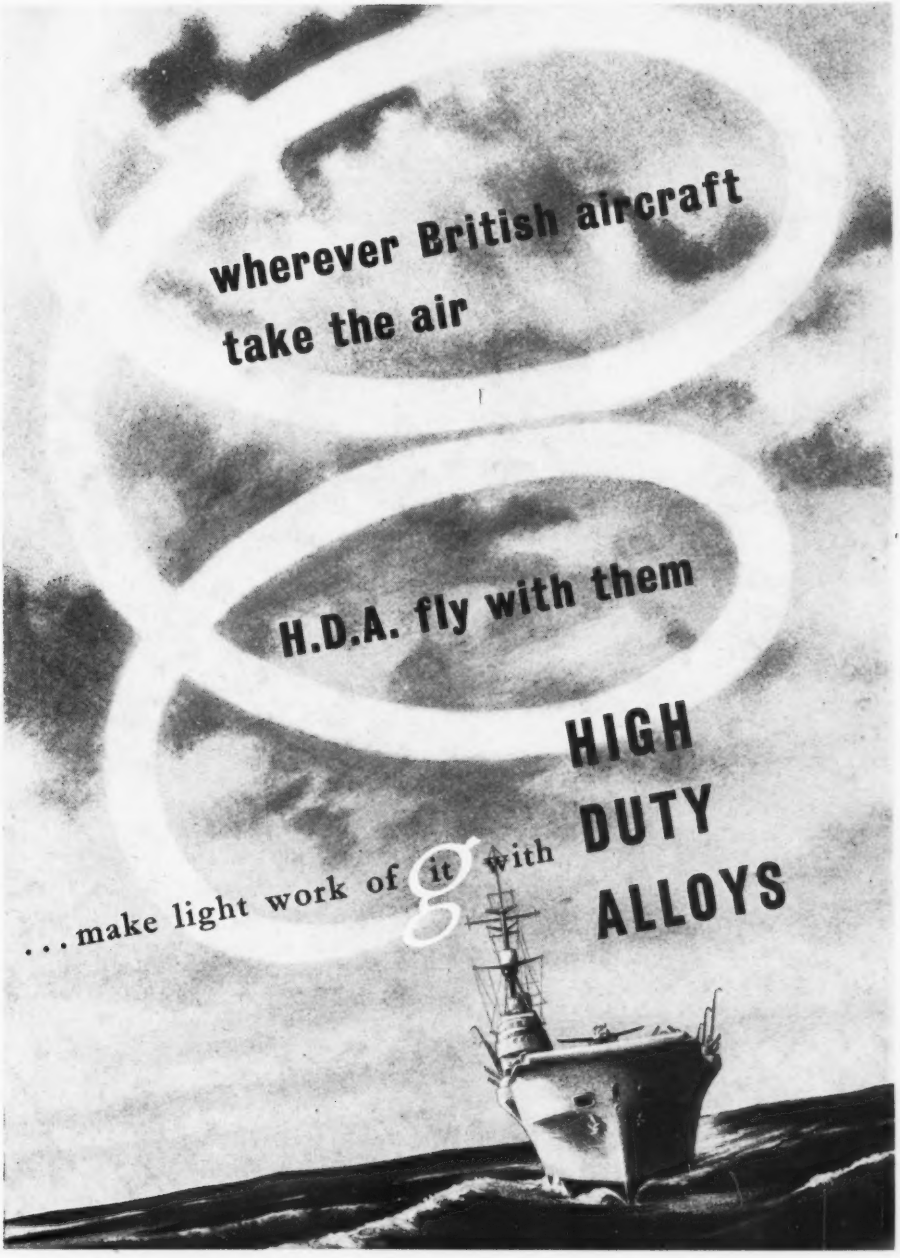

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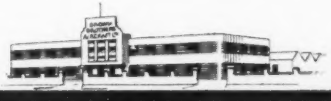

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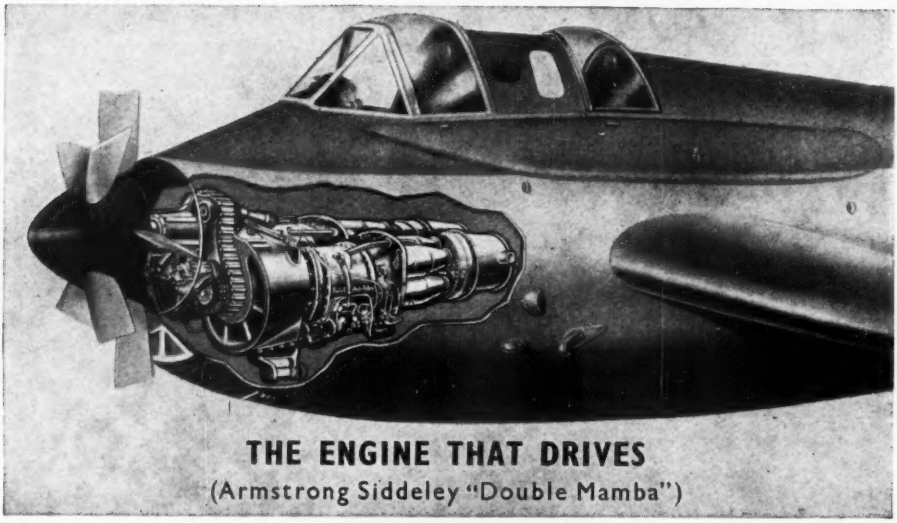

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First Aeronautical Weekly in the World

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Sea Changes

THE enthusiastic response to an issue of *Flight* devoted almost wholly to the Royal Air Force (published on July 6th last, but already long out of print) was abundant encouragement to follow up with a similar review of Naval Aviation. This is now presented. During its compilation a number of facts emerged. The first was that the silence of the Senior Service is no longer so sepulchral as of yore : once our requirements for producing the issue had been stated, results (in the form of official guidance and special facilities) were immediate and unstinted.

Visits to operational and training units confirmed that the Service is in stout heart. The greatest pride is taken in the achievements of H.M.S. *Theseus* off Korea, and there is pleasurable anticipation at the imminent arrival in service of Vickers-Supermarine Attackers, Westland Wyverns and—somewhat later—Hawker Sea Hawks, de Havilland Venoms and Fairey 17s.

Each on his own theme, senior officers have set down their observations and ideas expressly for this issue (see page 450). These demand the attention of all who follow the fortunes of "the Navy that flies". We are especially happy to print the message from Captain Bolt, of H.M.S. *Theseus*, and take this opportunity of recording our appreciation that, with his ship more or less constantly in action, he should have found time to make this inspiring signal. In applauding the technical achievements of the aircraft industry he has chosen the happiest possible theme, for the Naval/air re-equipment programme will demand the utmost from all manufacturers concerned, if the lofty standards set by the Sea Furies and Fireflies in Korea are not to be lowered.

Though slow to introduce gas turbines into regular service, the Royal Navy is now firmly committed to a very extensive turboprop and turbojet programme. That operating problems will arise—and be duly surmounted—there is no doubt, and, heavy fuel consumption notwithstanding, the selected turbine units promise to bring real benefits in their train, not the least being that of eliminating high-octane fuel from the necessarily vulnerable aircraft carrier.

But the most highly developed airframes and power plants will be near-impotent if the radar for search and the weapons for attack are not of commensurate quality. That the whole field of anti-submarine warfare has been the post-war preoccupation of some of our most capable brains is good reason for consolation on this score. To a large extent the problem is, in any case, one of *applying* techniques, and the adoption of the Percival Prince "flying classroom", which affords the means of rapid and thorough instruction in the use of sonobuoys and other devices, is further reassurance.

As for the basic training of aircrews, there is general satisfaction at the friendly and rewarding co-operation now apparent between the Navy and the R.A.F. in this all-important aspect of rearmament.

The body of this present issue is almost wholly devoted to the men of Naval Aviation and the aircraft they operate and maintain, but some reference seems appropriate to guided missiles and their influence on the development of Naval flying. The Fairey Stooge of 1945 exemplified the ship-to-air defensive missile, but the time may be approaching when long-range guided weapons will supplement the heavy naval gun and even, in some degree, the traditional naval strike aircraft. Meantime, new air-to-air and air-to-ship weapons will augment the hitting power of conventional' types of carrier-borne aircraft.

Altogether, the decade upon which Naval Aviation has just embarked will be of the greatest technical interest. Catapults, and perhaps the "more unorthodox" methods of take-off mentioned by the Fifth Sea Lord last November, may become the order of the day, in conjunction with undercarriageless landing. For all-weather anti-submarine operations the large helicopter, capable of operating from a merchantman, will almost certainly enter the picture.

Whatever the future brings, Naval Aviation will comport itself Trafalgar-style—Taranto-fashion. To its past achievements and present endeavours this issue pays tribute.

BY THE EDITOR

ILLUSTRATED BY "FLIGHT" PHOTOGRAPHS

No. 41 of the Series

Smooth air over the sea made it possible to bring the Sturgeon close into (or under) the photographic Rapide. The blades of the contra-props fitted to the two R-R. Merlins appear to have a supersonic sweep.

STURGEON in the Air

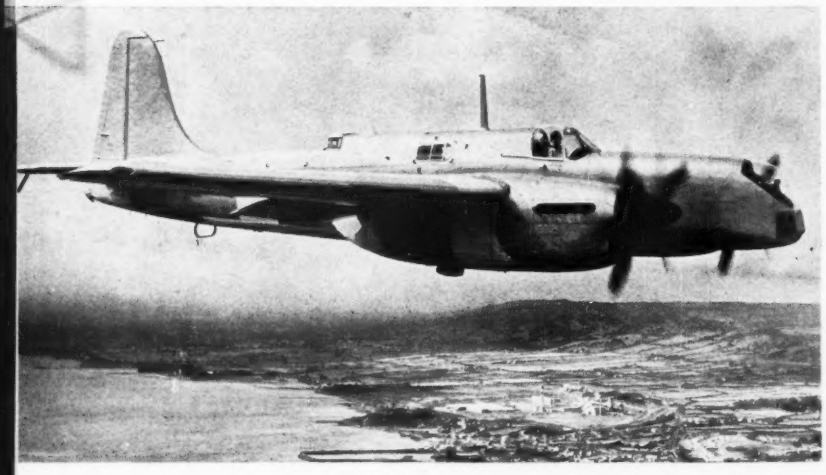
Friday the Thirteenth with Short's "Luxury" Target Tug

SUPERSTITION is a lot of nonsense, of course, and the fact that the day chosen for me to fly the Short Sturgeon T.T. Mk 2 turned out to be Friday, April 13th, was going to make no difference at all, for the idea was merely to register some everyday impressions of the aircraft; after all, Boscombe does the evaluation and top-limit tests.

It has been said of the old Stirling bomber that its chief fault was that it was too well made; another Short product, the Solent, is a Rolls-Royce of civil flying boats; and the Sturgeon must surely be the most luxurious target tug to be ordered for any Service. Reports of its handling qualities were all reassuring to an intending pilot who had hibernated during the long winter months, and to whom the memory of flying anything at all comparable with the Sturgeon was very remote.

The Mk 2 target-towing version of the Sturgeon was designed specifically for the job at the request of the Admiralty, who had previously assessed the Mk 1. The duties of the aircraft are target-towing for ground-to-air firing; target-towing for air-to-air firing by day and night; throw-off target practice and marking; photographic marking; and radar calibration. The crew is normally made up of two: the pilot and an all-rounder with the duties of navigator and operator of radio, winch and camera. Except when engaged on photographic marking the crewman occupies the aft compartment. He moves forward by climbing through a tunnel passing beneath the wing spar and the pilot's cockpit. His cupola in the rear compartment has optically flat glass panels and may be rotated in either direction. Below it is the rear camera station.

The weather was invigorating: bright sunshine and scudding cotton-wool clouds and, elsewhere over Ireland, some sleet and hail storms. Wind was strong, gusting to over 30 knots. Little white horses galloped down the loch from Belfast. Someone quoted an American's assessment of Belfast weather—"If you can see the hills it's going to rain; if you can't see them it's raining." For rain one could also read hail or snow.



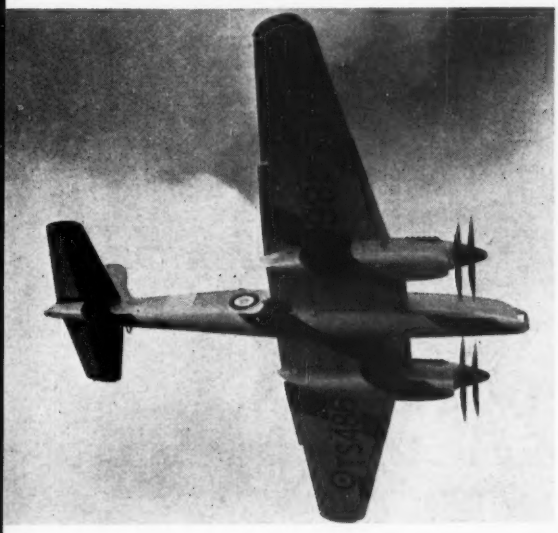
Although the pilot sits in solitary state there is room round him in the nose and in the fuselage sufficient to accommodate four others. The normal crew comprises the pilot and one equipment operator behind him.

On the previous night my bedtime story at the Short company's comfortable country guest-house had been Pilot's Notes, and over breakfast the study was resumed. Then Mr. Brooke-Smith, chief test pilot, showed me over the cockpit and added his briefing, and all that remained was to sign the blood chit: name, address, designation, date—what was the . . .? oh yes, pity.

It was no trouble to clamber up over the wing and get installed in the roomy cockpit, and after a period for checking, I received the "ready for starting" thumbs-up from the ground crew. Generator, hydraulic and pneumatic pumps are all on No. 1 (port) Merlin, so that was the one to start first. The pilot's

check-list contains 153 items, some of which I had taken in before getting in and others during a round-the-cockpit routine check made earlier. Before starting, the ground/flight switch goes on to "flight," the fuel selector cocks—port and starboard—to one or other of their respective pairs of tanks, and the engine master cock to "on." Booster pumps go on for a few seconds to prime the lines. The rest of the checks include: pitch to full fine; supercharger in auto or M.S.; rad. flaps closed or auto as required; air intakes, in; fuel cross-feed, off.

The Merlin 140s carry automatically indexing cartridge starters, for which there is a master switch and two firing buttons which also operate the booster coils. All seemed to be ready, so it was switches on, throttle about 1½in open, select priming line and three shots of the pump. On the second bang the Merlin roared into life with a great milling of contra-blades and a puff of hot fumes and smoke from the very adjacent stubs. After a few more strokes of the primer, the engine settled down at 1,200 r.p.m. to warm up, and I turned to No. 2. Again it was a check on fuel cocks (port side), change over (with a fiddling little tap) to port priming line, set controls and switches as before, prime, and press the starter button. The primer pump did not feel as if it was filling, but I gave four strokes and then thumbs up and press. Bang, but no catch. Pause while the ground crew re-selected a cartridge (the auto device had been disconnected). Bang again,



No beauty, yet pleasing and purposeful with its yellow and black zebra stripes, the T.T. Mk 2 has a folding nose, in addition to folding wings, for carrier operation.

but still no result. The engine, it seemed, was over-wet with fuel and would not fire.

The next trick was to open the throttle wide and shoot off one cartridge to try to clear the cylinders. This did not work, and I was getting rather harassed. After a further wait for evaporation and reloading, the signal to fire came again and I reached out, lifted the cover flap and pressed. No result. Funny; what now? But, horrors, where was my finger? (Don't tell me). I was pressing the starboard fire extinguisher button placed a few inches to the left of the starter buttons, and as the full, mortifying truth dawned upon me the thick yellow fluid began to ooze from every crack in the port nacelle and drool dismally down the undercarriage leg. Talk about Friday the 13th. I switched off and abandoned ship; and Brooke-Smith, bless him, only said "It's been done before."

Three-quarters of an hour later, after a cup of tea had helped to dispel my embarrassment and a good-humoured ground crew had removed the cowlings and washed the engine down, I started out again. No. 1 engine fired at once, but No. 2 was again over-rich. The Rolls-Royce representative joined in and, after a couple of shots we had a short council of war with him sitting on the cockpit edge beside me. Imagine our surprise when suddenly, without any help from anyone, another cartridge went off. Fortunately the ground crew were all clear of the blades. The Rolls-Royce man remarked that he wasn't superstitious either . . .

Next time she caught and roared into life, and all was well except that by now cloud was building up and lessening the chances of good air-to-air photography which was to be a part of the flying programme as soon as I had got used to handling the Sturgeon.

After running up, checking airscrews and magnetos, and exercising the blower gears, I put both rad. flap switches on auto, checked brake pressure and taxied out. Belfast Tower came through well on channel C, and I received permission to backtrack up the runway instead of using the perimeter track.

Taxying was no trouble at all. The brake lever on the spade grip gave smooth control differentially through the rudder pedals and the engines were unexpectedly responsive to small throttle movements. The gusty wind snatched at the rudder and ailerons and rocked the Sturgeon gently on its soft-sprung undercarriage. The narrow, curved screen panels, long nose and big, close-in engines do not make for the best forward view, but it is good enough, and tail-down one swings the nose to see better.

Take-off checks came next, and on these I trusted to memory and the standard formula. On pressing the flap selector take-off button (three push-buttons look after up, take-off, and full down) I noticed that the flaps sailed smoothly down to the full open position. Surely this was not more finger trouble? But even as I watched they started to come back again, having apparently decided to go the long way round to take-off position at 16 deg. I raised them again and then, taking my left forefinger in my right hand, I placed it carefully on the take-off button and pushed again. This time the flaps stopped in the right place. Subsequently, in the air, they tried the down-up business twice more when take-off flap was selected. The flaps are large and of the split trailing-edge type constructed in four sections: one inboard and one outboard of each engine nacelle to allow for wing folding. Wing-folding controls and locking-pins are checked during the cockpit examination prior to take-off checks. There is no fear of the wings folding in flight, a device being incorporated which necessitates the weight of the aircraft being on the undercarriage before the pins can be withdrawn.

At long last I was lined up, all checked, with permission to go and the two Merlins dragging at the brakes at the stipulated +2 lb boost.

I let the brakes go and opened up. With a delightful surge of power—1,660 b.h.p. per Merlin 140—and no tendency to swing at all, the Sturgeon bored its long nose into the fresh wind, and before I had time to decide whether +12 lb boost would be enough on a 1,100 yd runway at 20,050 lb weight I was off and climbing with 700 yd at least to spare. Take-off and touch down speeds are both about 75 kt at representative weights.

There was no hurry about wheels up; better first to get steady on the climb, which in this direction takes one over Belfast. At a couple of hundred feet a long push on the retracting button brought the wheels up, but one red light stayed on. A second push locked the recalcitrant wheel, and it was time to turn left on the circuit away from the town.

As I flew in a north-westerly direction, away from the city and airfield, weather was excellent and visibility such that no map was likely to be needed. At a modest 2,650 r.p.m. and +6 lb boost the Sturgeon climbed firmly through the wide gap in the cloud at the prescribed 140 kt. At the full climbing power of 2,850 r.p.m. and +12 lb boost, the initial climb approaches 2,500ft/min. The supercharger gear changes at 12,500ft if left in auto. When flying the Sturgeon for range, incidentally, the book figure quoted for speed is 145 kt at all heights. For endurance, 130 kt is best—as low down as safety permits.

The Sturgeon handles pleasantly, and like a machine of medium-to-large-size (the span is, in fact, 60ft, though it looks less). The controls are well synchronized, but all on the heavy side, particularly at the higher speeds around 300 kt I.A.S. Under 200 kt they are much lighter and the ailerons become slower in action. The rate of roll is not high; however, the T.T. Mk 2 is not aerobatic and does not require to roll rapidly.

All the controls have trimmers operated from the cockpit in the natural sense, and these are powerful and sensitive. The elevators and rudder carry geared balance tabs combined with the trimmer tabs. The ailerons have spring-balance tabs. The Sturgeon trims for hands-off flying with two engines pulling or with one feathered. One of its strong points is the good single-engine performance. Naturally, if the dead engine cannot be feathered things become more difficult with one contra-prop windmilling. Safety speed on take-off in the worst case is quoted as 130 kt. Normally, down to 100 kt is O.K. for single-engine flying.

The maximum permissible speed for the Sturgeon is 360 kt. It can tow a 2ft sleeve at a true air speed of 285 kt at 15,000ft, and a 4ft sleeve at 250 kt at 15,000ft. If the 32ft winged target is on tow, 230 kt can be attained at the same height.

Having no aerobatics to try out to establish confidence, I tried some power-off stalls. These are quite straightforward and

STURGEON IN THE AIR . . .

there is no attempt to spin or drop a wing unexpectedly. With full flap and some power on, the speed is very low, being about 70 kt with nose well up. Naturally, the stall is more abrupt under these conditions, and I was told that in an extreme case with near full power at about 65 kt the wing may drop very abruptly in the stall. With engines throttled back and at a speed of about 80 kt the sink is gentle and a slight buffeting gives warning of the stall. Elevator and rudder control remains in some degree right down to the stall, but the ailerons almost fade out rather earlier. When trying later to formate with the photographic Rapide, the Sturgeon wallowed somewhat at 100 kt, but could be held well enough in the smooth air over the sea.

Having learned something of the handling, I turned towards Belfast, only to find it obliterated by a sharp storm of snow and hail. I skirted the edge of it and waited to follow in behind. The appearance of snowflakes apparently moving horizontally towards the aircraft, slowly at first and then with a great rush, never ceases to be surprising. Tracer used to come up in the same way at night.

During the photographic sortie, which proved rather a struggle, what with increasing cloud, rough air and the speed discrepancy, I noticed the effect upon trim of lowering flaps or opening the rad. flaps. Both actions cause a slight nose-up change. As speed increases, the effect of moving the rad. flaps, already modified for this reason, becomes more marked. On the approach the wheels and flaps cancel out more or less in their trim effects. I recalled the handling notes giving figures for slow flying of not less than 110 kt with take-off flap and 2,650 r.p.m., and for rough air not less than 180 kt. Perhaps the Sturgeon itself has not learned these yet. Certainly it was no good expecting more than 100 kt out of the Rapide in rough or smooth air with its door open to give a clear sweep for the cameras. While talking of limitations, one for the Sturgeon which deserves quoting reads as follows: "Max. speed for reeling out—130 kt."

After one hour's flying, I changed tanks as a precautionary measure (I had started out with 50 gall per tank) and dived back to Belfast at low level under cloud. I reached the airfield a few seconds before another snow shower and, receiving permission to go straight in, turned left, dropped the wheels as the speed dropped to 150 kt, and prepared to approach. The wind had veered quickly through 90 deg, so I had a short runway to land on with the lough as overshoot. It was bumpy over the hills on the approach, and kept the speed at about 130 kt to start with, easing off to 100 kt over the boundary. I decided to use full flap and floated farther than I expected. The landing was delightfully easy and gentle, and I just failed by inches to get my tailwheel down at the same moment as the main wheels. This, I was told later, is the normal thing, elevator control usually running out at the last moment. Certainly, I cannot remember a more pleasant aircraft to bring in, and there are few to equal it. The view is good on the approach and the undercarriage wide and beautifully sprung. As I came down so did the hail.

Space permits a mention of only one or two other qualities of the Sturgeon, and time and the weather prevented my trying more landings or overshoots. Noise has been described in the past as excessive, but, due perhaps to a mod. (alteration of the position of blade intersection) it did not seem to me to be too bad. The cockpit is roomy and comfortable, though the seat lacks arm-rests. View is good in all directions except aft. The controls and instruments are all adequate with the relatively unimportant exception of the priming pump and its engine selector cock, of which I have seen better examples. The many knobs and switches come to hand well.

One reaction to the Sturgeon will no doubt be forthcoming from this generation of jet aviators, namely (in addition to noise) the complication of a piston-engined twin with flying crew of one. In this, however, the Sturgeon is no different from several other non-jet types.

In conclusion, it must be stated that this description deals with only a small portion of the Sturgeon's considerable repertoire, which includes carrier landings and take-off with catapult or R.A.T.O.G. assistance—both the wings and the long nose fold for storing away in a carrier—and, of course, its primary duties of drogue and glider target towing. The experience was sufficient, however, to make one feel content to fly the Sturgeon (or its S.B.3 turbine powered relation) on any job which might arise in the future.

DATA FOR THE SHORT STURGEON T.T. Mk 2

Two 1,660 h.p. Rolls-Royce Merlin 140s. Rotol contra-rotating airscrews

Span	59.9ft
Span folded	20ft
Gross area	653.5 sq ft
Length	48.9ft
Height folded	15.71ft
Gross weight	22,350 lb
Max. continuous cruising speed at 27,500ft	308 knots
Max. range at 10,000ft. and 165 kt	1,030 n.m.
Rate of climb, continuous at S.L.	2,470 ft/min
Service ceiling	35,000ft
" " on one engine	23,000ft
Landing speed, still air	70 knots (80 m.p.h.)
Take-off distance in still air, max. a.u.w.	330 yd
" " against 27 kt wind	115 yd
Fuel capacity	430 gall
Representative towing endurance, 32ft winged target	3 hr

FROM ALL QUARTERS

Neville Duke's Appointment

ON Saturday last Hawker Aircraft, Ltd., announced the appointment of S/L. Neville F. Duke, D.S.O., D.F.C., A.F.C., as their chief test pilot, in succession to the late S/L. Trevor Wade, D.F.C., A.F.C. Neville Duke, who is 29, has been Hawker's assistant experimental pilot since May, 1948.

S/L. Neville Duke

After a distinguished war-time record as a fighter-pilot (he shot down 28 enemy aircraft), S/L. Duke became a member of the High Speed Flight in 1946. A course at the Empire Test Pilots' School was followed by a period of test-flying at Boscombe Down. As a civilian test-pilot, Duke set up a number of point-to-point records in piston-engined Furies, in addition to sharing responsibility for developing the post-war series of high-speed Hawker jet aircraft. S/L. Duke recently took command of No. 615 (County of Surrey) Squadron R.Aux.A.F., which is equipped with Meteor 4s.

Producing the Comet

IN a lecture given before the Royal Aeronautical Society on April 12th, Mr. H. Povey, A.F.R.Ae.S., Director (Aircraft Production), de Havilland Aircraft Co. Ltd., outlined in unusually well-illustrated detail the planning and production methods used in the construction of the Comet.

The combined circumstances of unusual structural design and the decision to produce the aircraft virtually from the drawing board made it imperative that the utmost co-operation between the design, experimental, test laboratory and production departments should be achieved. Mr. Povey made admirably clear the complexity of the undertaking, and gave a convincing demonstration of some of the background detail which has contributed to making the Comet what it is. We hope to present a more detailed summary of the lecture in a subsequent issue.

Migs in Germany

A CORRESPONDENT writes that the "headquarters" of Soviet jet fighters based in Germany seems to be Finow, near Eberswalde, north of Berlin. Only Mig-15s have been identified. They are present in great numbers at Finow, Oranienburg, Werneuchen, Doeberitz and Rangsdorf. Our correspondent considers the turbojets fitted to be of axial type—not centrifugal—as popularly supposed. From cruising flight the Mig accelerates and climbs remarkably quickly, and he believes there is either an afterburner or rocket in the tailpipe; it is said to make "an enormous noise." The Russians are said to be diffident about operating their jets in anything but the best weather. Nevertheless, they recently flew Mig-15s by night from Staaken.

Piston-engined machines lately identified in Germany—again "in great numbers"—include Il-10, Tu-2 and Po-2.

Radio Inventors' Claim

SITTING at Somerset House, London, on April 12th, the Royal Commission on Awards to Inventors heard Sir Robert Watson-Watt begin his statement of a claim for himself and six other scientific workers in respect of radar. The other claimants are Mr. A. F. Wilkins, Dr. E. G. Bowen, Dr. Denis Taylor, Dr. A. G. Touch, Mr. R. Hanbury Brown, and Mr. K. G. Budden. All seven had reached agreement that their applications

should be advanced as a single claim. They would be "entirely happy" to have any recommendations for an award made as a single lump sum, which they themselves would be prepared to divide in proportions already agreed.

Sir Robert Watson-Watt said that, at the request of the Director of Scientific Research at the Air Ministry, he undertook late in 1934, or early in 1935, to investigate the possibilities of a "death ray" for use against aircraft. He submitted a memorandum in which he said he was strongly against the economic possibility of such a ray, but said that he was examining the problem of detecting enemy aircraft by radio. Between 1933 and 1935, said Sir Robert, a "handful of bright young men," at the Slough radio research station were allowed to select their own problems to study; it was this training in versatility of approach that was the key to their success in the development of radar. In May, 1935, development facilities were made available and the pioneer workers moved to Orfordness, Suffolk. The letters "R.D.F." used to describe the project on which they were engaged meant nothing whatsoever, though it was immediately assumed that they signified "radio direction finder." The following year the workers moved to Bawdsey, Suffolk, and after much research and experiment an uninterrupted "frontier" of radar stations from Aberdeen to the Isle of Wight, with a detached element at Scapa Flow, was put into operation. The chain was manned by Service personnel on a 24-hour watch until after V.E. Day.

On April 13th—the second day's hearing of the claim—Mr. P. Stuart Bevan, representing the Ministry of Supply, stated that Britain spent about £250 million on her radar services during the war. Sir Robert had earlier estimated expenditure at about double that figure. The hearing was adjourned until May 22nd.

Cranfield Dinner

LAST Friday evening, April 13th, the Senior Common Room Society of the College of Aeronautics, Cranfield, held their third annual dinner, and this extremely pleasant function was attended by a large number of eminent guests. During the speeches—which we shall report next week—valedictory references were made to the retiring Principal, Mr. Relf, who has done so much to make the College the success it is today.

Recognition Enthusiasts Warned

THE chairman of the Aircraft Recognition Society, Mr. E. G. A. Wilton, has sent members a warning on the subject of security. Most members, he says, possess information of some kind which has not been generally released. He exhorts them not to discuss such knowledge even with fellow-enthusiasts in the privacy of their own meetings. The well-being of the Society, he adds, is endangered by thoughtlessness in this matter.

Synthetic-Adhesive Course

BELIEVED to be the first of its kind, a course in the technology of synthetic resin adhesives, is to be held this autumn by Aero Research, Ltd. Of five days' duration, the course is designed to cover (1) the use of synthetic resin adhesives in the woodworking industries (2) their application to engineering, electrical manufacturing and other industries. Alternative programmes will be arranged, but some lectures (e.g., introductory talks on plastics, fundamentals of adhesion, methods of reducing setting-times) will be common to both courses.

Demonstrations and practical work will be at the firm's headquarters at Duxford, while lectures will generally be held in Cambridge. Accommodation will be provided at St. Catherine's College, where the course will assemble on September 23rd.

Applications for enrolment, it is stated, have already been received from half a dozen Continental countries. A brochure is obtainable on application to Aero Research, Ltd.

Major Geminis

DURING the dreary waterlogged winter months Wolverhampton Aviation, Ltd., has amongst its other activities been hard at work on Gipsy-Major-powered Miles Geminis. The delivery of one such aircraft to the Shell Petroleum Co., Ltd., was illustrated last week. This is one of four similar Mk IIIA Geminis with D.H.Gipsy Major 10 engines which have been assembled at Wolverhampton.

The word "assembled" is used intentionally, although it is something of an understatement. The four Geminis under consideration were purchases in units off the Miles production line after the company had gone into liquidation, and Wolverhampton Aviation have now completed the complicated business of assembling the airframes with all modifications to date; fitting the high-powered engines; making other improvements; and, finally, of testing and licensing the aircraft. During the winter the company have in fact restressed the Gemini airframe as a double check in view of the increased authorized maximum weight and considerably higher speed.

DOWN TO THE SEAS AGAIN: Ageing, but still eminently useful, Sunderland 5 flying boats (four Pratt and Whitney Twin Wasps) are being reconditioned at the Belfast works of Short Brothers and Harland, Ltd., for service with the R.A.F. and France's "Aéronautique Navale." In this "Flight" photograph of two of these machines before delivery the Frenchman can be distinguished by the lack of squadron letters.

Differences between the Gemini IIIA, of which three have so far been completed, and the standard IA in addition to the engines include replacement of the batteries behind the cabin bulkhead; installation of a veneered-wood instrument-panel; improvement in soundproofing; and fitting of the latest type of tyres with strengthened walls. A full blind panel and Pesco pump are fitted as standard.

The Major 10s are fully-screened engines and carry a 500-watt generator. A metal airscrew is standard equipment on the Wolverhampton IIIa. The r.p.m. indicators remain on the nacelles.

Authorized maximum a.u.w. is 3,300 lb—300 lb more than the standard aircraft. With pilot and full main and long-range tanks —66 gall total—380 lb of payload still remains for disposal in the cabin and nose compartment. If radio is fitted (the Shell aircraft carries S.T.R.9) this figure is, of course, reduced.

A full fuel-load is sufficient for a cruising range of just over 700 miles at a speed of 155 m.p.h. at 2,200 r.p.m. with airscrews of fairly coarse pitch. The maximum continuous cruising speed at 2,300 r.p.m. is 165 m.p.h., and the all-out level speed, 182 m.p.h. Take-off is reputed to be quite exceptional, so the coarse-pitch airscrews are carried easily. The standard price quoted by Wolverhampton Aviation is £3,250; with radio and other extras such as sunblinds, the Shell aircraft cost £4,000.

An early converted privately-owned Gemini IB is also being repowered with later Majors—10s—and will become a IIIB. This machine is to have retractable flaps.

It will be recalled, incidentally, that Mr. Miles, whose name the Geminin bears, is building a modified version of the aircraft with 150 h.p. Cirrus Major engines, to be called the Aries.

FORTHCOMING EVENTS

Apr.	21.	Helicopter Association: Film Show, R.Ae.S.—*Night Hop* and *History of the Helicopter*.
Apr.	26.	R.Ae.S.: Discussion: "Air Travel from the Passenger's Point of View."
Apr.	26.	R.Ae.C. Film Show: *Flying Club*, 1925-50, film and commentary by A. Graham Head, and *Eagles of the Fleet*.
Apr.	28.	Exeter Aero Club Rally.
Apr.	29.	First International Helicopter Competition, Italy.
May	5-8.	Foire de Paris Rally, Toussus-le-Noble.
May	6.	R.Ae.S.: Garden Party, White Waltham.
May	12-13.	Isle of Wight Air Races.
May	12-14.	Aero-Club de France: Champagne Rally.
May	13-14.	S.M.A.E. International Model Competitions.
May	14.	S.S.A.F.A.: Air Display, Hucknall, Notts.
May	19.	Derby Aero Club: "At Home" and Flying Display.
May	19.	Helicopter Association: Annual General Meeting.
May	20.	Kent Coast Flying Club: "At Home" (sponsored by A.B.A.C.).
May	26.	Newcastle-on-Tyne Air Display.
May	26.	Wolverhampton Aero Club: "At Home" and Goodyear Trophy Race.
June	2-4.	Yorkshire Aeroplane Club: International Rally.
June	2.	Auster Flying Club: Rally, Rearsby.
June	3.	Auster-Ragosine Homing Trophy, Rearsby.
June	8-10.	Air Circuit of Sicily.
June	9.	Rally and Race, Fairwood Common Aerodrome, Swansea.
June	9-10.	Royal Air Forces Association: Annual Conference, Torquay.
June	10.	Lancashire Aero Club: "At Home" (sponsored by A.B.A.C.).
June	15-18.	Royal Danish Aero Club: International Rally.
June	15-	Paris Aero Show.
July	1.	
June	24.	International Rally, Pisa, Italy.

HERE AND THERE

"Flight" drawing

CHIMERA II: Such is the designation given by S.I.A.I.-Marchetti to this jet-powered passenger transport which, its designers hope, will not prove to be a "fantasy without a follow-up." It is intended to have "even greater range and better economy of operation than the D.H. Comet."

Swiss Venoms

TO pay for the construction in Switzerland, under licence, of 150 de Havilland Venom fighters, the Swiss Government has voted a credit of £14,500,000.

V.C.A.S. and Inst. T.

AMONG those recently elected additional ordinary members of the council of the Institute of Transport is Air Chief Marshal Sir Ralph Cochrane, Vice-Chief of the Air Staff.

Korean Air Fighting

THE air war in Korea has lately intensified, and it has been made known that a total of five U.S.A.F. Superfortresses have been destroyed. A number of Mig-15s have been shot down and many more damaged by Superfortresses, Sabres and Thunderjets. A North American B-45 four-jet bomber returned safely after being attacked by two "Russian-type jet fighters." This was the first encounter between jet fighters and a jet bomber.

Airship Revival

BRITAIN'S new (and only) airship, the 100-ft *Bournemouth*, will, it is hoped, make its first flight from Cardington early next month. This news was given last week by Lord Ventry, chairman of the Airship Club, and the moving spirit behind this attempt to revive controlled lighter-than-air flight in Britain. Design and construction of the ship were featured in *Flight* of November 16th, 1950.

M.O.S. and M.C.A. Changes

MR. F. C. MUSGRAVE, C.B., formerly Under-Secretary (Air) at the Ministry of Supply, has now been appointed as a Deputy Secretary. He is succeeded in his former appointment by Mr. L. J. Dunnett, C.M.G., who has hitherto been in charge of the Air Services Division of the Ministry of Civil Aviation. Mr. Dunnett's successor at the M.C.A. is to be Mr. A. H. Wilson, C.B., C.B.E.; Mr. Wilson, who was formerly Under Secretary, Aerodrome Services, is succeeded by Mr. T. F. Bird, former head of the Economics and Intelligence Division.

"Flight" photograph

TOGETHER AGAIN: Vice-Admiral R. Bell-Davies, V.C., C.B., D.S.O., giving the toast of the Royal Naval Air Service at the second reunion of the R.F.C. and R.N.A.S., held at the Dorchester Hotel, London, last Friday. An illustrated report will appear next week.

R.A.F. versus F.A.F.

THE Royal Air Force Rugby XV beat the French Air Force team 9-3 at the University ground at Oxford on April 12th. The R.A.F. scored a penalty goal and two tries against a try.

Hermes V Incident

DURING a test-flight from Boscombe Down on April 10th, one of the four Theseus turboprops of the Handley Page Hermes V experimental airliner suffered c.s.u. trouble and the unit was shut down to prevent overspeeding. Shortly afterwards, two of the other turboprops lost power—for reasons so far unexplained, but presumably due to fuel starvation. The Ministry of Supply test-pilot, Mr. William Burton, made a skilful one-engined emergency landing, with undercarriage up, in a field near Andover. Damage was confined mainly to the airscrews.

IN BRIEF

FROM the Cierva Autogiro Co., Ltd., comes news that their office at Southampton has been transferred to London: all correspondence should now be addressed to the company at River Plate House, 12-13 South Place, London E.C.2.

* * *

Flight regrets to record the death of Mr. Sidney Wolfe, founder of Wolf Electric Tools, Ltd. Eighty years of age, Mr. Wolfe recently retired from the chairmanship.

* * *

A recent paragraph under the heading "R.A.F. Appointments" should have made it clear that A.Cdre. E. W. Towsey, C.B.E., has been appointed Command Defence Officer, B.A.F.O., while A. Cdre. C. J. Luce, D.S.O., goes to a similar post at M.E.A.F. H.Q.

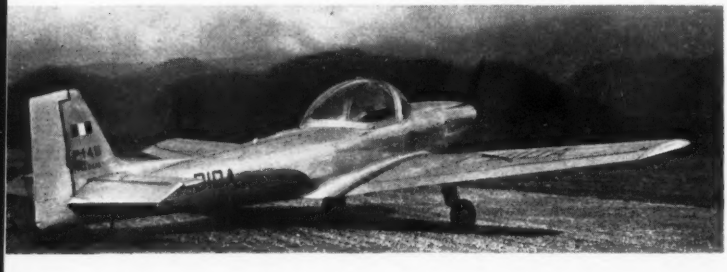
* * *

Referring to the stainless-steel hose described in *Flight* of March 9th, Avica Equipment, Ltd., now ask us to add that the sole manufacturers are the Power Flexible Tubing Co., Ltd., Derby Works, Vale Road, London, N.4.

* * *

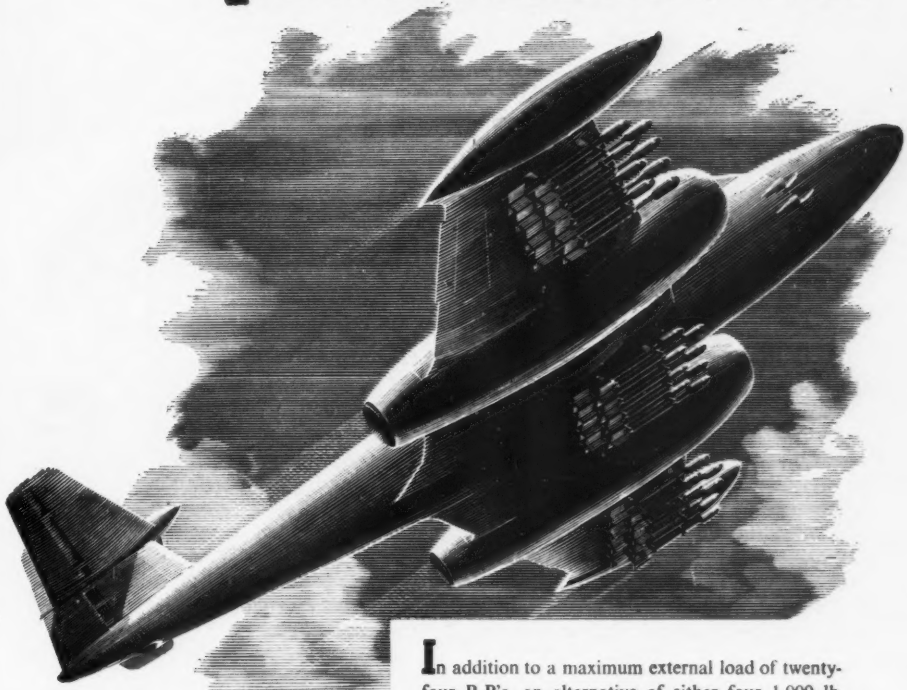
Among the exhibits contributed by Marconi's Wireless Telegraph Co., Ltd., to the "Communications" section of the transport building at the South Bank Exhibition will be a replica of the radio compartment of the D.H. Comet with the Marconi transmitting, receiving and D/F equipment in place.

ANOTHER ITALIAN: This trim Piaggio product is the P.148—a new basic trainer designed for the Italian Air Force as a private venture. The power unit is a 190 h.p. Lycoming engine, giving a top speed of 147 m.p.h. There is side-by-side seating with an optional third seat aft.



Meteorific

performance *Plus*



FRANK E. WILDE

In addition to a maximum external load of twenty-four R.P's, an alternative of either four 1,000 lb. bombs or extra fuel in ventral and underwing drop tanks may be carried on this, the new tactical ground attack version of the Meteor.

A further alternative armament load can be effected by the attachment of a streamline blister pack beneath the centre section, containing two additional cannons.

Wing tip tanks are a standard fitting and provision for R.A.T.O.G. ensures that the full potentialities of this essential and very formidable aircraft can be employed under the most adverse of take-off conditions.

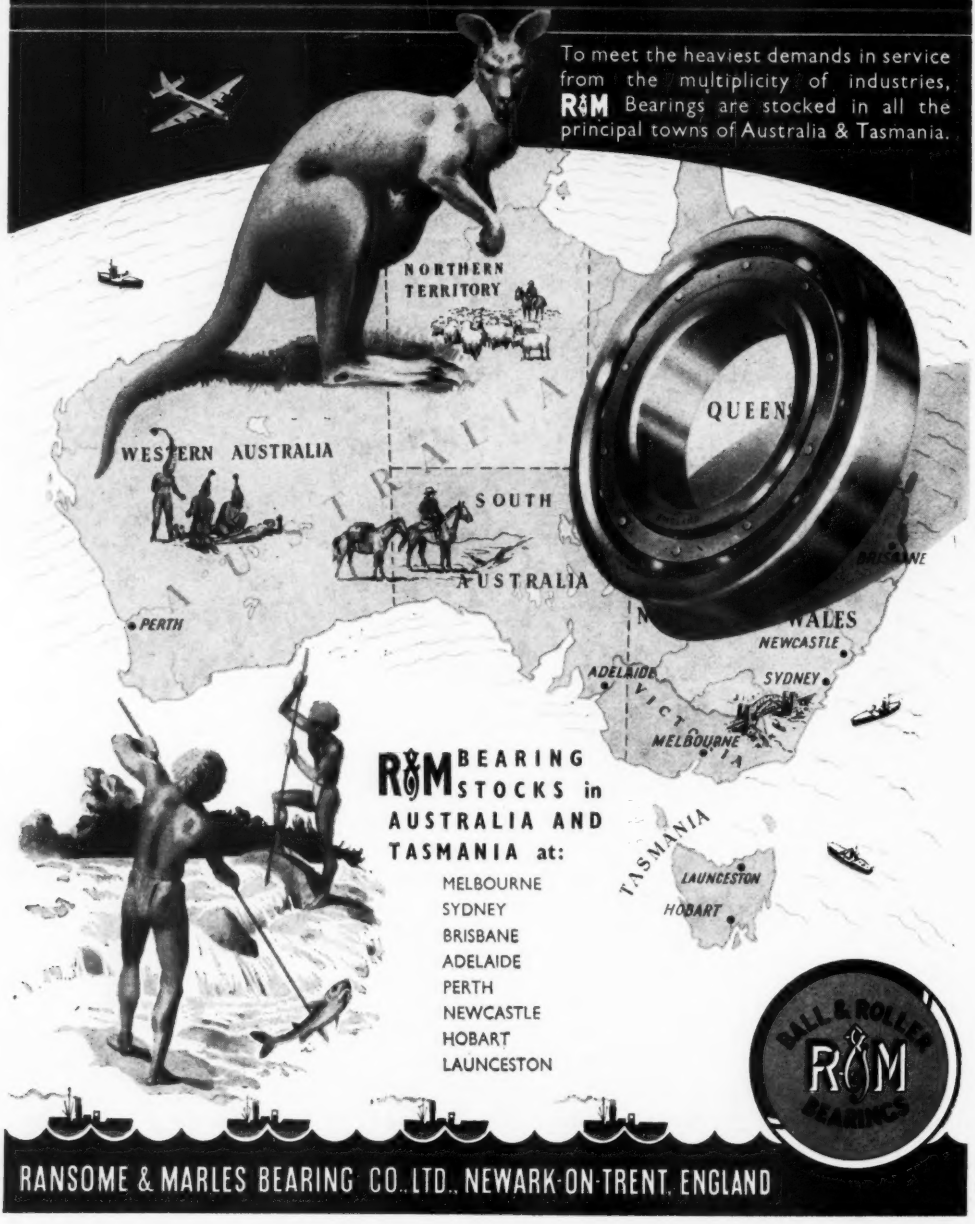
GLOSTER METEOR

Tactical ground attack Fighter

GLOSTER AIRCRAFT CO. LTD. (Member of the Hawker Siddeley Group)

P.V.

IN FAR AWAY PLACES
THE ISLAND CONTINENT



RANSOME & MARLES BEARING CO. LTD., NEWARK-ON-TRENT, ENGLAND

K/RM.68

CIVIL AVIATION

NIGHT SHIFT: This impressive view of Idlewild, New York's busy international airport, illustrates the exceptionally good lighting which has been provided on parking aprons and near terminal buildings, many of which are of only temporary construction. The airport, incidentally, also boasts the three largest arched steel hangars in the world.

THE ADVISORY COUNCIL'S REPORT

IN a preface to the third report of the British Air Transport Advisory Council, covering the period January 1st, 1950, to December 31st, 1950, the Minister of Civil Aviation, Lord Pakenham, refers to the question of making available, to the public, cross-country air services which are in themselves unremunerative. "This," he says, "is a difficult problem, since whatever agency is used to provide such services, the cost must ultimately fall on the taxpayer." Lord Pakenham states also that, while continuing to study this problem, he does not wish to raise any hopes that cross-country services which are not of vital importance to the communities concerned, and which can only be operated under arrangements which require a subsidy in one form or another, can be justified at the present time; all efforts are now being directed towards reducing the cost to the national exchequer of British domestic services.

The Minister mentions that, during 1950, there were only four instances in which he was unable to accept the Council's recommendations for Associate services to be operated by charter companies. Three of these concerned applications for international services and the fourth concerned a weekly Anson service between Liverpool and Jersey, which was opposed by B.E.A. on the ground that it would compete with the Corporation's intended flights between Manchester and Jersey.

The Council's report shows that the results of cross-country services operated under Associate Agreements have confirmed the argument previously advanced to the Council by the B.A.C.A., namely, that such flights could pay their way only when run in conjunction with other, more remunerative, services. The report states that as B.E.A. progressively takes over the better-paying routes, it will become increasingly difficult for charter companies to run the others; indeed, certain applications for routes in 1951 are said to have been conditional on the applicant being authorized to run other services which he considered to be complementary.

During the year only three representations from the public were received by the Council. These concerned excessive fares charged for long-distance overseas travel; a request for a feeder-service from Dundee or Perth to link up with the Aberdeen-Edinburgh Prestwick-Belfast route; and a complaint about delay and inconvenience caused on scheduled associate services between Strasbourg and London. The Council considers that the very small number of representations made may mean that the public is satisfied with the services provided by the Corporations.

Some 177 effective applications from charter companies to operate scheduled services and inclusive tours under Associate Agreements were received during the year. Of these the Council recommended that 96 (including 16 for inclusive tours), should be approved. Most of the applications were for services to holiday resorts during the summer, a large number being for flights to the Channel Islands and the Isle of Man. In 28 cases the applicants decided not to proceed with their arrangements and in nine other cases, in which the Minister was ready to give his provisional approval subject to airfields being available, it was found impossible to arrange for the use of suitable airfields. As previously mentioned, in four cases the Minister was unable to accept the Council's recommendations; the remaining 55 applications, however, were fully approved.

In its report the Council states, also, that it has reaffirmed a previous decision not to recommend the operation of Associate services by single-engined aircraft. The total of passengers carried on Associate services during the year is said to have been about 66,000, a slight increase on the figure for the previous year. The most successful routes were those to the Isle of Man, on which over 45,000 passengers were carried on ten routes. Services to the Channel Islands were confined during 1950 to routes from the provinces, since B.E.A. provided more capacity from the London area than in 1949. A few services were provided on trunk routes, such as Northolt-Manchester-Blackpool and Northolt-Leeds-Newcastle, but the number of passengers carried and the load factors achieved were relatively low.

As in 1949, the experience of Associate companies operating cross-country routes indicates, reports the Council, that in general the public demand for these services is not very great. On international routes, also, with the exception of the Silver City car ferry from Lympne to Le Touquet and Aquila Airways' Southampton-Madeira services, load factors were disappointing.

The Council's general conclusion in its review is that the Minister's decision—not to deny the public such facilities as the charter companies were prepared to provide under the Associate arrangements—has justified itself. While expressing the hope that the greater security of tenure which is being granted to companies on certain routes by the new arrangements (announced earlier this year) the Council confirms that within the next five years B.E.A. intend to take over more routes which have hitherto been operated under Associate Agreements.

U.S. PROTOTYPE TESTING

LAST month the Prototype Testing Committee, set up on January 19th by the Civil Aeronautics Administration, decided to ask the U.S. Government for a £2,000,000 appropriation to be used in operational trials of the North American B-45 jet bomber, the Convair Turboliner, the Chase C-122 transport and one large transport-type helicopter. A cargo version of the 40-seater Convairliner, powered by two Allison 501 turboprops, is now in the initial stages of its flight-test programme.

The committee chose the Chase C-122 to evaluate the practical aspects of a high-wing, low floor-level, cargo and feederline transport. It was designed as a twin-engined assault transport with a maximum gross weight of 40,000 lb and a maximum speed of 240 m.p.h.

Discussions on the availability of equipment for use in the simulated jet-airliner testing programme indicate that the 550 m.p.h. B-45 (Tornado) may be available within the next few months for this purpose. The C.A.A. hopes to conduct similar tests with the Turboliner and the Martin 4-0-4 with turboprops about the beginning of next year.

Another interesting aircraft which, it has been intimated, may also take part in similar trials, is the Douglas C.124 Globemaster, powered by Pratt and Whitney T.34 turboprops. It is not thought that this machine will be available for at least two years, however.

On the subject of American transport prototypes, also, a technical sub-committee of the Prototype Aircraft Advisory Committee recently discussed the tentative specifications for both feederline and cargo-carrying aircraft, which were originally

CIVIL AVIATION . . .

drawn up by representatives of U.S. manufacturers last year.

For the feederliner, the original specification included a minimum payload of 5,250 lb, seating capacity for 24 passengers, provision for turboprops to replace piston engines, a range of 350 miles and a cruising speed of 275 m.p.h. The sub-committee has agreed that the size chosen in this specification was about right but considers that special attention should be paid to the problem of converting the aircraft readily for mail and cargo use when passenger load-factors are found to be low. It has decided, also, that the aircraft should be capable of operating from a 2,800 ft single-runway airfield, instead of the 3,300 ft runway proposed in the previous specification.

For the prototype cargo aircraft the committee decided that the speed range previously envisaged was too low and that a block speed of approximately 300 m.p.h. was called for. The feasibility of changing the cargo aircraft to operate from a 5,000 ft instead of a 4,000 ft runway was suggested, to eliminate any possibility of handicapping the design.

The sub-committee agreed also that the smaller of the two proposed cargo prototypes should have a gross weight of 30,000 lb and a range of 2,000 miles with reserves. A further meeting is being held this month.

GERMAN AVIATION

THE Allied High Commission in Western Germany recently opened investigations into the possibility of allowing Germans to control their own civil airlines once again. Two plans are under consideration. The first would involve an immediate programme under which they would be trained to take over full control as soon as possible of the airports now used by international operators.

The second suggestion concerns a long-range plan to suspend all Allied supervision and allow Germany a return to international air traffic for the first time in 13 years. It is estimated that it will take from five to six months to train the Germans to run their own airports which, although at present manned by local personnel, are still controlled by the High Commission. If such a preliminary step were taken it is possible that after a few years the world may yet see a re-birth of something like the old German Lufthansa, which was disbanded in 1938.

In the more immediate future, probably, the Germans can be expected to continue the High Commission contracts with U.S. and European airlines now serving German airports. Moreover, it is believed that the difficulties of obtaining the necessary equipment, now that the major producer-nations are re-arming, would preclude the formation of any national airline capable of competing with companies already operating in Germany.

BREVITIES

THE seventh annual general meeting of I.A.T.A., which is being held this year in Britain, will actually take place in the historic Hall of Westminster School. In place of the traditional Annual Paper, a full day has been set aside for I.A.T.A. delegates to visit the S.B.A.C. show at Farnborough. It is also announced that the Israeli national airline, El Al, and the Yugoslav operator, J.A.T., have joined the Association, whose membership now comprises some 65 airlines from 45 countries.

* * *

To cater for tourist-traffic expected during the summer months, Yugoslavia will shortly inaugurate four new services, linking her most important cities. Plans are also reported for a new service between Belgrade and Frankfurt.

* * *

Earmarked for delivery in 1952 are three Douglas DC-6A all-cargo transports which American Airlines have ordered from the manufacturers. The company's present freighter fleet of 13 are all DC-4s. The DC-6 has a maximum payload of 30,000 lb and a range of 3,300 miles.

* * *

Led by Mr. S. L. Hof, Director of the Department of Telecommunications and Air Traffic Control in the Netherlands, an I.C.A.O. technical mission left for Teheran on April 16th to aid Iran in the development of her civil aviation programme; three of the members are British. The despatch of this mission marked the start of a technical assistance programme which is expected to provide aid to some 15 countries this year.

* * *

An A.N.A. Bristol Freighter was recently fitted with specially developed "double-decker stalls" to carry 102 stud sheep on an 800-mile journey from Hobart, Tasmania, to Parkes, New South Wales. The company's Freighters have also been busily engaged in the carriage of wool from Tasmania to the mainland and at the conclusion of the recent sales flew over 1,000,000 lb of wool to Melbourne for distribution. The Freighter's payload is 11,000 lb of wool on each flight.

* * *

The chairman of Auckland's International Airport Committee, Sir Keith Park, indicated recently in New Zealand that if present plans to build a suitable airport at Auckland were finalized, landplanes may soon be replacing the flying-boats now used on the trans-Tasman run.

What is believed to be the largest aviation-fuel contract ever negotiated by an airline was recently signed between United Air Lines and the Standard Oil Company of California. The order, for more than £25,000 worth of fuel, will meet the company's requirements for three years. The amount represents a rise of 75 per cent over the previous three-year period—an increase which is due to extension of routes and the addition of a further 50 aircraft to United's existing fleet of 131 machines.

* * *

During March, for the fourth month in succession, great increases have been noticed in the amount of traffic carried on the Corporation's dollar-earning New York to Nassau route. Last month the total was 44 per cent. more than in February on the 23 flights which were scheduled in each direction. Since its inauguration last November this route has proved to be one of the Corporation's best revenue-earners.

* * *

Three recipients of I.C.A.O. Technical Assistance Fellowships recently arrived in the United Kingdom for courses of training. Two are from the Civil Aviation Department in Baghdad and one from Helsinki. Five Ethiopian pilots who were also granted Fellowships will shortly arrive in this country to train for commercial pilots' licences with A.S.T., Ltd., at Hamble.

* * *

The M.C.A. has published a useful little booklet entitled *Aviation Law for Applicants for the Private Pilot's Licence* (M.C.A.P. 85—H.M. Stationery Office, price 1s.) which completely covers the syllabus required for this licence. All the essential information, collated from the mass of legislation which today tends to confound the private pilot, are presented in this booklet in easily understandable form.

* * *

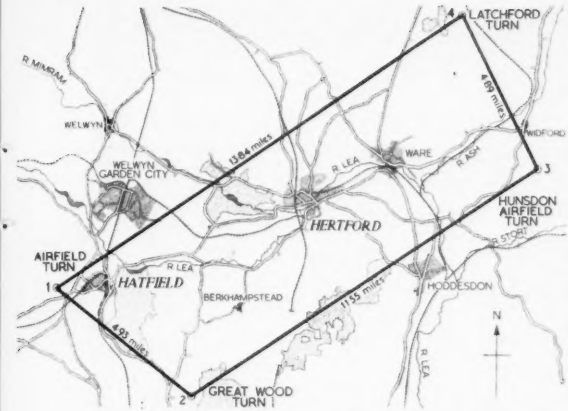
Capt. P. G. Taylor and the crew of the Catalina flying boat, *Frigate Bird II*, now returning from Chile to Australia after crossing the South Pacific, had to swim ashore at Mangareva (Gambier Islands) to find petrol which had been left beneath the coconut palms by a French Government schooner. It was then floated out to the boat by native canoes. A number of ideal aircraft bases have been noticed on the return flight, which is being made by way of the Tuamatu or Low Archipelago in French Oceania. On arrival in Chile, Capt. Taylor was awarded the Chilean Order of Merit.

NEWS of the 1951 AIR RACES

WITH arrangements for most of the leading events now well under way, this summer promises one of the most interesting racing programmes ever to be organized. As already announced, the Festival of Britain National Air Races (for the King's Cup, the Kemsley, Norton Griffiths and Grosvenor Challenge Trophies, the R.Ae.C. Jubilee Trophy, and the S.B.A.C. and Air League Challenge Cups) are to take place on Saturday, June 23rd, over courses based on Hatfield. The routeing of the 35-mile short circuit is shown in the first map on page 449.

For the information of competitors practising over the course beforehand, the Ministry of Civil Aviation has pointed out that, above 1,500ft a.s.l., the section of the course between Luton, Hatfield and Great Wood lies in the controlled airspace of Amber Airway II; pilots are therefore asked to exercise extreme caution on this account. Also, the last leg of the short circuit at Hatfield passes over the centre of Panshanger airfield, where intensive R.A.F.V.R. training takes place; pilots should keep a keen look-out in this area and are requested not to fly over Panshanger at less than 1,500ft above airfield level should they be unable to maintain flight under V.F.R.

Prices of admission for the National Air Races have now been published. They vary from £2 for a private car and its occupants



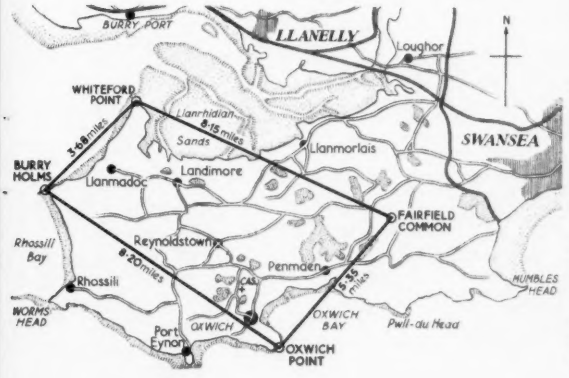
The 35-mile short-circuit which completes the 168-mile cross-country course for the National Air Races. Previously, aircraft will have flown from Hatfield to Southend, Cambridge, Luton, and back to Hatfield.

(non-R.Ae.C. members) admitted to the R.Ae.C. enclosure (£1 for R.Ae.C. members), to 10s for pedestrians in the same enclosure (R.Ae.C. members, 5s). The price of admission for pedestrians to the public enclosure is 4s.

In connection with the Festival of Britain celebrations, also, the Swansea and District Flying School and Club have inaugurated a Welsh "Air Derby" which is to be flown over three laps of a 25-mile course. The venue is Fairwood Common and the date June 9th; the route to be followed is shown in the second map. The first prize for this event will be £125; second, third and fourth prizes of £75, £50 and £25 respectively are also being awarded. A special prize of £25 is to be given for the leading aircraft whose gross weight does not exceed 1,200 lb and whose power rating is not more than 70 h.p. In conjunction with the "Derby" an air-display programme is also being arranged.

In the following month—on July 14th—Bristol will enter the air-racing calendar. The Corporation is offering prizes of £100, £50, £25, £15 and £10 to the holders of the first five places in a race over three laps of a 30-mile rectangular circuit based on Whitchurch. The course (shown in the third map) passes over Lulsgate airfield, Clevedon and Portishead and, the race is open to British-registered, piston-engined aircraft of under 10,000 lb a.u.w. In addition to prize money, the winner will also receive the Avion Challenge Trophy presented by the Bristol and Wessex Aeroplane Club. There is an entry fee of £10 for this race, £5 of which is returnable to all actual starters. Details of conditions

A new race this year is the Welsh "Air Derby," which is being flown on June 9th over a 25-mile course based on Fairwood Common airfield, near Swansea.

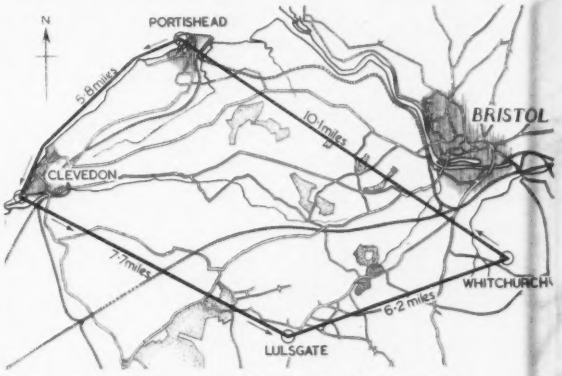


and entry forms may be obtained on application to the airport manager.

Among events not specifically linked with the Festival is the annual Goodyear Trophy Race and air display at Wolverhampton airfield (organized by the Wolverhampton Aero Club), which takes place on May 26th. The race (on handicap and open to piston-engined aircraft) is over three laps of a quadrangular course of approximately 32 miles. The prizes offered are £100, £50 and £25 respectively. In addition, the first finisher using Goodyear tyres, wheels or brakes, will receive an extra £10. The club has reduced the entrance fee to £2 2s and all pilots wishing to take part may obtain the necessary forms from the club secretary. Entries must be in before May 7th.

Regulations have also been published for the *Daily Express* Challenge Trophy Race which proved so successful last year. It will be held on August 6th. This year's course differs from 1950 all-coastline route in that, starting from Shoreham instead of Hurn, it proceeds coastwise to Newhaven, where the second leg becomes a cross-country flight to Whitstable. From Whitstable the course follows the coast to Brighton; the finishing point is the West Pier. The race is open to any type of aircraft, of any nationality, with gross weight not exceeding 10,000 lb. Of the £2,250 prize-money, £1,000 will go to the winner.

On August 18th the Wiltshire Flying Club is to hold its annual race from Thruxton to the Isle of Wight.



In connection with the Festival, also, a 90-mile race has been inaugurated by the Corporation of Bristol. Three circuits are to be flown over the 30-mile course shown above.

Some other Sporting Fixtures

UNTIL the racing season gets under way British pilots can assuage their appetite for competition by taking part in some of the numerous "dawn patrols" which are now beginning. One of the first of these is being organized by the Redhill Flying Club for the morning of April 2nd. As usual, visiting pilots seeking the traditional free breakfast must attempt to reach Redhill, unspotted, between the hours of 9 and 9.30 a.m., having flown through the defence zone, which extends from one to three miles from the airfield, at altitudes of between 1,000 and 3,000ft. Should the weather prove unco-operative on this occasion, pilots are asked to consult Notam 210/1950.

At Panshanger, on April 29th, the London Aeroplane Club is holding a similar event, at which E.T.A.s are to be between the same time-limits. The defence zone, in this case, extends from between one and five miles from Panshanger at a height of 1,000 to 2,000ft. The patrol will be followed by something rather less exciting, though of greater moment—the club's A.G.M.

Another annual event, the date of which has recently been announced, is the Auster Ragosine Homing Trophy on Sunday, June 3rd; it will be preceded on the Saturday by the Auster Flying Club's Rally.

In the immediate future there are also a number of club rallies at which visiting pilots will be welcome. On April 28th the Exeter Aero Club is holding one, and on May 12th-13th, there are the annual display and round-the-island race organized by the Bembridge and Sandown (I.o.W.) Club. On May 19th and 20th At Homes and flying displays have been arranged by the Derby and Kent Coast Flying Clubs respectively. On the following week-end an air display is being held at Newcastle-on-Tyne, and from June 2nd to 4th the Yorkshire Aeroplane Club will be the hosts at the annual international rally at Sherburn-in-Elmet. The R.Ae.S. Garden Party is on May 6th.

SIX IMPORTANT MESSAGES

From the FIRST LORD of the ADMIRALTY.
Viscount HALL of CYNON VALLEY, P.C.

FOR centuries, no armed force has played a greater or more consistent role in world history than the Royal Navy. As the years have passed, the Navy has changed, sail giving way to steam, and timber to steel and coal to oil; by availing itself of all that modern invention and ingenuity can offer, it has maintained a power and mobility which have been constantly underestimated by its opponents. But although the Service has changed and its present-day duties extend over distances and embrace functions which would have astonished our ancestors, its effectiveness as a stabilizing influence on the world's affairs has, over the centuries, remained unimpaired. In this momentous task Naval Aviation, which since 1939 has been an integral part of the Royal Navy, plays a proud and vital rôle.

From the FIRST SEA LORD and CHIEF of NAVAL STAFF.
Admiral of the Fleet Lord FRASER of NORTH CAPE, G.C.B., K.B.E.

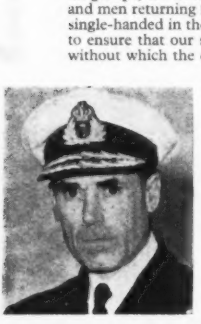
WHEN the name Fleet Air Arm was changed to Naval Aviation, the Navy showed that its air element had evolved from an auxiliary into a major, integrated part of the Service. Indeed, modern fleets are built around the carrier in the same way that the fleets of the past were built around the battleship. Moreover, in the vital role of protecting trade and supplies to this country, Naval aircraft will always have an essential part to play, and recently Korea has again shown the value of an aircraft carrier in support of the Army ashore. World War II set the seal on the Navy's air-mindedness, and our aviators distinguished themselves in every sea theatre, ending with our very extensive carrier operations alongside the U.S. Navy in the Pacific. As my time in command of the *Glorious* reminds me, to operate from the deck of a carrier at sea, in weather conditions more often than not far from ideal, requires a high degree of skill and resourcefulness. Our aircrew standards must, therefore, necessarily be very stiff, and one of the serious problems that the Navy faces today is to obtain the right type of young man to fly our aircraft when there are so many other attractive, though perhaps less adventurous, careers for him to choose from. Myself, I can think of no finer way of serving the country than by volunteering for this inspiring task.

From the FIFTH SEA LORD and DEPUTY CHIEF of NAVAL STAFF (AIR).
Vice-Admiral M. J. MANSERGH, C.B., C.B.E.

I HEARTILY commend *Flight's* decision to devote this issue to Naval Aviation, which today plays an ever-increasing part in the Royal Navy's task of securing our sea communications. In past years, while we were gaining experience in the difficult art of designing aircraft which could operate from the deck of a ship, we have, perforce, had to accept limitations in performance in order to achieve those characteristics which make an aircraft suitable for flying on to and off an aircraft carrier. The requirements of modern warfare, however, make it essential that Naval aircraft shall be the equal in performance of their land-based counterparts—or even superior to them. Great study has been and still is being given to the means of overcoming the difficulties inherent in running a mobile floating air base, which is what an aircraft carrier really is. These difficulties we are surmounting successfully and, in the near future, from new or fully modernized carriers, incorporating the most up-to-date equipment, we shall be flying turbine-powered fighters, anti-submarine and strike aircraft the equal of any in the world.

From FLAG OFFICER AIR (HOME).
Vice-Admiral C. E. LAMBE, C.B., C.V.O.

LANDING aircraft on an aircraft carrier and operating from the deck is an adventure—there is nothing quite like it in aviation. For this, as for all exacting adventures, it is prudent to be well prepared. The necessary preparations include the practical test and development of fighter, anti-submarine and strike aircraft which can meet the limitations of the flight deck without sacrificing their fighting efficiency; teaching officers to fly and to fight in all weathers; training officers and ratings to keep the aircraft in perfect condition; and maintaining in readiness the reserves of trained aviators and aircraft to support the Naval Air Squadrons—for these matters the Home Air Command is responsible. It keeps in close touch with the Fleet and is constantly refreshed by periodic visits from the carrier air groups, for whose accommodation and shore training it is responsible, and by the regular infiltration of officers and men returning from sea-service to the staffs and air stations. Although sea power may not be able to win a war single-handed in these days, it could still assuredly lose one by default. The Command exists to serve the fleets and to ensure that our ships, wherever they may be in the oceans, are provided with an air component at instant call, without which the exercise of sea power is, today, impossible.



From FLAG OFFICER COMMANDING 3rd CARRIER SQUADRON.
Rear-Admiral C. JOHN.

THE employment of carrier-borne aircraft afloat is complementary to that of R.A.F. Coastal Command aircraft from shore bases. Both are part and parcel of maritime warfare. Aircraft carriers provide aircraft in the oceans at the place and time where and when they are most needed to meet a quickly changing situation with which, for simple reasons of time and space, our friends in the R.A.F. cannot be expected to compete. Carriers provide us with a means of concentrating air power at our own selected time and place to gain local superiority for a limited period. It is this flexibility, coupled with the many subsidiary and often unexpected functions which ships and aircraft can together perform, that has made the aircraft carrier of today the principal offensive and defensive unit of our fleet.

From COMMANDING OFFICER, H.M.S. "THESEUS".
Captain A. S. BOLT, D.S.C., R.N.

THE achievements of Royal Naval aircraft in the Korean war can give legitimate pride to all those concerned in their design, development and production. Those who can see in the battlefield the results of their efforts are ever mindful of the long chain of effort which makes their successes possible. H.M.S. *Theseus* in the Yellow Sea has the honour to be in the vanguard of the fight against Communism. I hope that those who do the essential but perhaps sometimes unspectacular work of producing the tools for Naval Aviation can take comfort and satisfaction from the way the job is being done. The splendid aircraft made by the men and women of Britain have helped the Royal Navy to take an effective part in the war in Korea. I send my thanks for the skilled workmanship and devotion which have made it possible for these aircraft to operate reliably at great intensity under all conditions.

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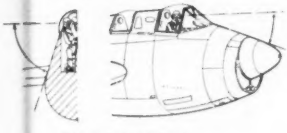

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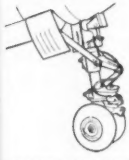

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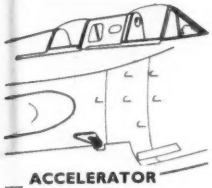

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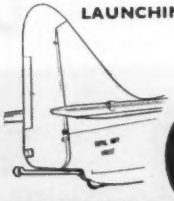

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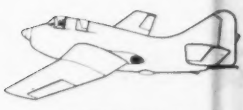

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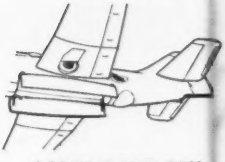

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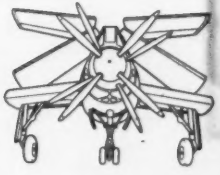

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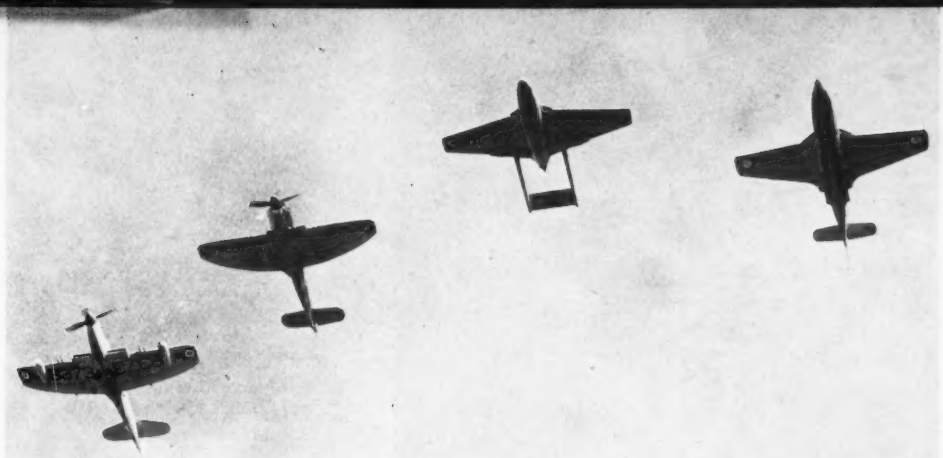

NAVAL AVIATION TODAY

ORGANIZATION, STRUCTURE AND COMPOSITION

By C. B. Bailey-Watson

NAVAL AVIATION is a noun which, in common with many others, has an active sense; and this is important, for it emphasizes that flying is an intrinsic part of naval operations. No longer a secondary branch of the Service, Naval Aviation today is by far the largest single department of the Royal Navy, and despite the demands it makes in terms of specialized training, specialist ships, equipment and shore establishments it is, fundamentally and essentially, an integral part of the Navy as a whole.

On the Board of Admiralty, the Fifth Sea Lord is mainly responsible for air affairs, and within the Admiralty are the several divisions concerned with the basic organizational requirements of training, equipment and all the manifold diversities appertaining to an air force. Tied in with this is close liaison with the Ministry of Supply. Implementation of the air policy laid down by the Board of Admiralty is vested in the Commanders-in-Chief of the fleets and in the Flag Officer Air (Home). The fighting of the carriers and the work of their Air Groups whilst embarked, is the responsibility of the C.-in-C. of the fleet of which they are a part, but the onus for supplying Air Groups in fully operational condition to equip the carriers is that of the F.O. Air (Home) who is, in effect, the C.-in-C. of a training and reserve air force.

At the present time, the operational strength of Naval Aviation is distributed among the Home Fleet, Mediterranean Fleet, and the Far East Station, and under the individual C-in-C. of the fleet, the carriers comprising the task group or squadron are commanded by a subordinate Admiral. By the same token, the command of the Flag Officer Air (Home), is divided into three departments, viz., Flying Training, Ground Training and Reserve Aircraft, each of which is commanded by a Rear-Admiral.

In peace-time, the fleet is divided up into squadrons of aircraft carriers, battleships, cruisers, and flotillas of destroyers. These groups are commanded by their individual Flag Officers and Captains (D), who are directly responsible to the C.-in-C. In war-time, however, ships are reformed into task forces and task groups, according to the operational requirements. A carrier task force consists of a number of task groups, each of which comprises up to five carriers, together with their escorting force, which last usually consists of one or two cruisers and 18 to 20 destroyers. The task force as a whole is commanded by a senior Admiral, who might well be the naval C.-in-C. of the theatre, whilst each task group is under the tactical command of a junior Admiral.

The jobs the individual task groups are detailed to perform are set by the task-force commander who might, for example, instruct two task groups to disrupt communications along the western half of Korea, and provide support for a number of front-line army divisions. In the instance cited, it is likely that one task group would be given the job of interdiction whilst the other would take on the army support duty. It is then up to the individual task-group commander to organize the day (and night) flying of the carriers comprising his group (*a*) to fulfil the task and (b) to provide protective cover for the group. The task-force commander is, of course, responsible also for the logistic organization of the force, that is to say, the appropriate withdrawing of task groups to refuel, replenish and rest as necessary. The organization of the task group's flying duty of necessity has to be closely co-ordinated, if only for the fact that all the carriers must hang together within their destroyer screen and thus turn into wind and turn out of wind together. It is usual practice when a carrier is operating at maximum effort over a period of days for 50 per cent of its available air strength always to be airborne, whilst the other 50 per cent are refuelling and rearming.

For months now, the light fleet carrier, H.M.S. *Theseus*, has been carrying out 60 to 70 two-and-a-half hour sorties each day in Korean waters; with 35 aircraft embarked, this is a truly magnificent effort. To a large extent, sortie capacity is, of course, governed by the aircraft serviceability factor—which, in *Theseus*, has been constantly above 90 per cent. Sortie capacity is, however, also influenced by turn-round time, i.e., the time necessary to land-on, refuel, rearm, re-spot, and fly-off one deck-load of aircraft preparatory to starting the cycle all over again for the aircraft which have returned from their work. Necessarily, there must be margins for emergencies, and the turn-round time is not easily reducible below about two hours. Throughout the whole day—anything from ten to 14 hours—the deck team is kept very busy indeed and, in fact, the ship as a whole is

(Left) Here seen from "Theseus" are "Vengeance," the destroyer "Corunna," and the S.A.N.F. frigate "Natal" all steaming out of Table Bay, S.A.

(Below) During the Korean winter, despite extreme conditions, "Theseus" carried out her operational tasks. A snow-covered deck may be easy to see, but there ends any advantage there may be.

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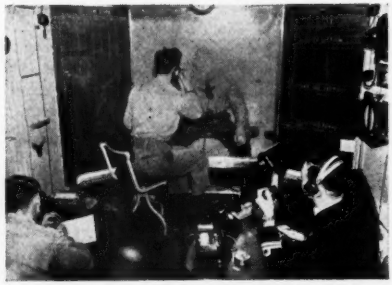
working flat out. There is, obviously, a limit beyond which fatigue costs so much in efficiency as to be no longer acceptable and, in view of this fact, the job *Theseus* has been doing in Korea, averaging 20 flying days per month—the remaining days are taken up with refuelling, replenishing and resting—is truly remarkable.

Each carrier in a task group is commanded by a Captain who, of course, is responsible for the fighting of his ship, but in this he is assisted—so far as air operations are concerned—by a Commander (Air) who is the immediate head of the ship's air department. Under the Commander (Air) are the Lieutenant Commander (Operations), the Direction Officer, and the Lieutenant Commander (Flying). The Lt. Cdr. (Ops.) is responsible for control of all the aircraft (except fighters) from the time they take-off until they return to the vicinity of the carrier. Having returned from a sortie, the aircraft await landing instructions in what is termed a "break-up circuit" (a holding-pattern orbit); from this, they are called into the landing circuit and are landed-on at the direction of the Lt. Cdr. (Flying). Fighters on combat air patrol (C.A.P.) are dealt with separately by the Direction Officer, who has the responsibility of ensuring that no unidentified aircraft approach without being intercepted. When fighters are used for such duty as army support, however, they are controlled by Lt. Cdr. (Ops.), although for ease of communication the actual channelling of control is almost invariably made through the Aircraft Direction Room.

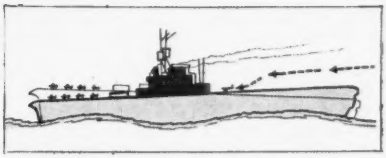
The Operations Room—which is the domain of Lt. Cdr. (Ops.)—is in the island of the carrier adjacent to Flying Control and the (compass platform) bridge. Here are housed a general-operations plotting table and a local-operations plotting table, together with a state-board showing aircraft (and aircrews) airborne and available. In this darkened room, usually too small comfortably to hold all the personnel

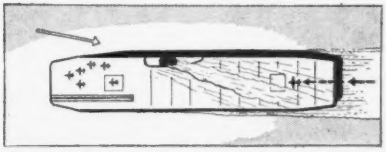


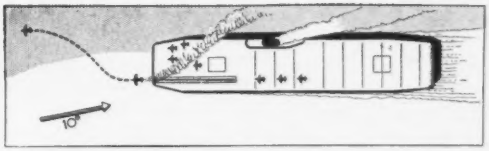
"Flight" Photograph

Interior of mobile Aircraft Direction Room. The carrier A.D.R. is necessarily very much larger and considerably more comprehensively and elaborately equipped.

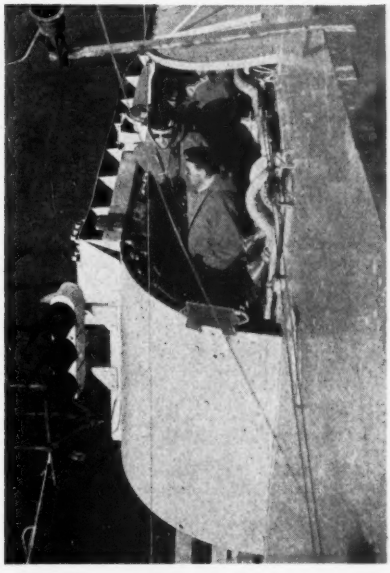
(Below) As the Sea Fury is launched, the Firefly is already moving up to the catapult ("Theseus" in Korea).







In heavy seas, when the carrier is pitching, aircraft are landed farther up the deck where the movement is reduced (top left). With the wind dead ahead or on the starboard bow, the turbulent wake of the island makes landing and take-off difficult (lower left), so normally the wind is brought on the port bow, in order that a steady wind over the deck is maintained for aircraft both taking-off and landing (top right).



Flying Control with the flight-deck in full view is on the port side of the island, with direct access from the bridge. Note traffic lights, voice-pipes, and communication equipment.

who cram themselves into it, up-to-date pictures of the area and local operations are kept. From these two ever-changing pictures the Captain and the Commander (Air) can readily sum up the general state of activity, and can accordingly plan for the immediate future.

The aircraft direction room (A.D.R.) is a relatively large compartment in the bowels of the ship, where the Direction Officer and his two junior Direction Officers sit facing a large Perspex wall on which is kept the main air display plot (M.A.D.P.). Information for the maintenance of this plot is fed in from the various sets of radar equipment, and complementary to the M.A.D.P. (which is centred on the carrier) is kept a geographical plot whereby the carrier and its airborne aircraft are illustrated relative to other ships and to the land.

Flying Control is on the port side of the island with direct access from the bridge. "Flyco" is the operative post of Lt. Cdr. (Flying) and, necessarily, Cdr. (Air) also spends a good deal of his time there. From Flying Control, there is direct communication (radio and voice-pipe) to all relevant parts of the ship, e.g., Ops. A.D.R., A.C.R., hangar, and, of course, the flight deck itself.

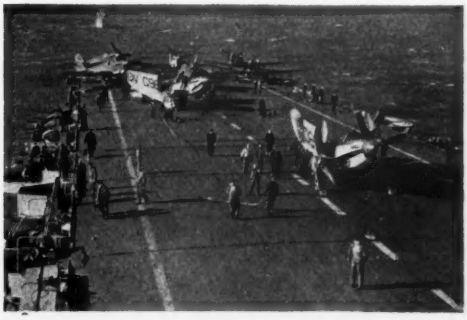
Pe haps the clearest picture of flight-deck organization is given by the processes concerned in flying-off a strike of aircraft and landing them on. Thus, initially, and assuming that, say, 15 aircraft are to do a "free" take-off, the machines will be spotted at the after end of the flight deck ranged in vics of three, or, where deck-run is at a premium either through lack of wind or aircraft weight, they might be spotted four abreast with wings folded. It is normal practice with free take-off for all engines to be started simultaneously; aircraft are manned 15 minutes before take-off time, and engines are started ten minutes before. Immediately engines are started, the red light of the "traffic lights" at Flying Control is illuminated. As soon as the Flight Deck Officer is assured by his petty officers abreast each range of aircraft that all is well, the signal for "chocks away" is given, and the amber traffic light is shown.

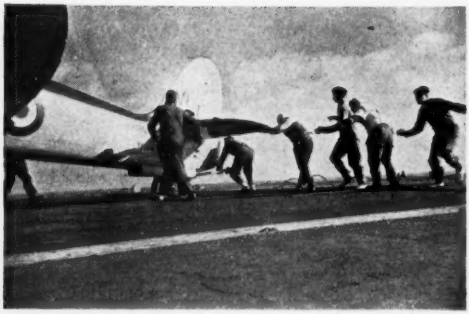
Thereafter, the first aircraft for take-off is moved forward

(Below) Fireflies being spotted in vics of three at the rear of the flight-deck for free take-off from "Vengeance."

(Below) The signal "chocks-away" has been given, the amber traffic light is shown and the Sea Fury moves forward for take-off.

"Flight" Photographs





"Flight" Photograph

As soon as an aircraft has landed-on, and the instant that it comes to rest, the hook is cleared of the wire and secured.

(Left) Brighton Beach with a "Vengeance." A photograph taken by Vice-Admiral Lambe, F.O.A. (Home), during a Mediterranean cruise.

NAVAL AVIATION TODAY . . .

so that its starboard wheel is on the centre-line painted down the flight deck; the pilot gives the thumbs up to the Flight Deck Officer who, immediately he sees the green traffic light from Flying Control, flags-off No. 1 aircraft. In the meantime, No. 2 aircraft will be moving to the take-off position and is in turn flagged away ten seconds after number one, and so it goes on successively, so that all 15 aircraft will have got away in 2 min, 20 sec. As each pilot becomes airborne, he jinks to starboard in order to free the man following of his slipstream. In this connection, it is relevant to note that the carrier is not headed into the eye of the wind, but normally brings the wind about ten degrees on the port bow; by so doing, the turbulent wake from the island and, of course, the slipstream from aircraft taking off, is kept clear of the aircraft following in take-off sequence.

It is here relevant to mention the use of the catapult. The high wing-loading of modern aircraft and the limitation of the speed with which a carrier can go through the water combine, in still-air conditions, to make it unlikely that, even with the full length of the flight deck in which to accelerate, the aircraft will attain full flying speed by the time it reaches the bows: the catapult is, therefore, becoming ever more frequently used and is, in fact, likely to be the normally accepted method of launching aircraft in the immediate future. (A description of the catapult mechanism is given in the article "H.M. Aircraft Carriers.")

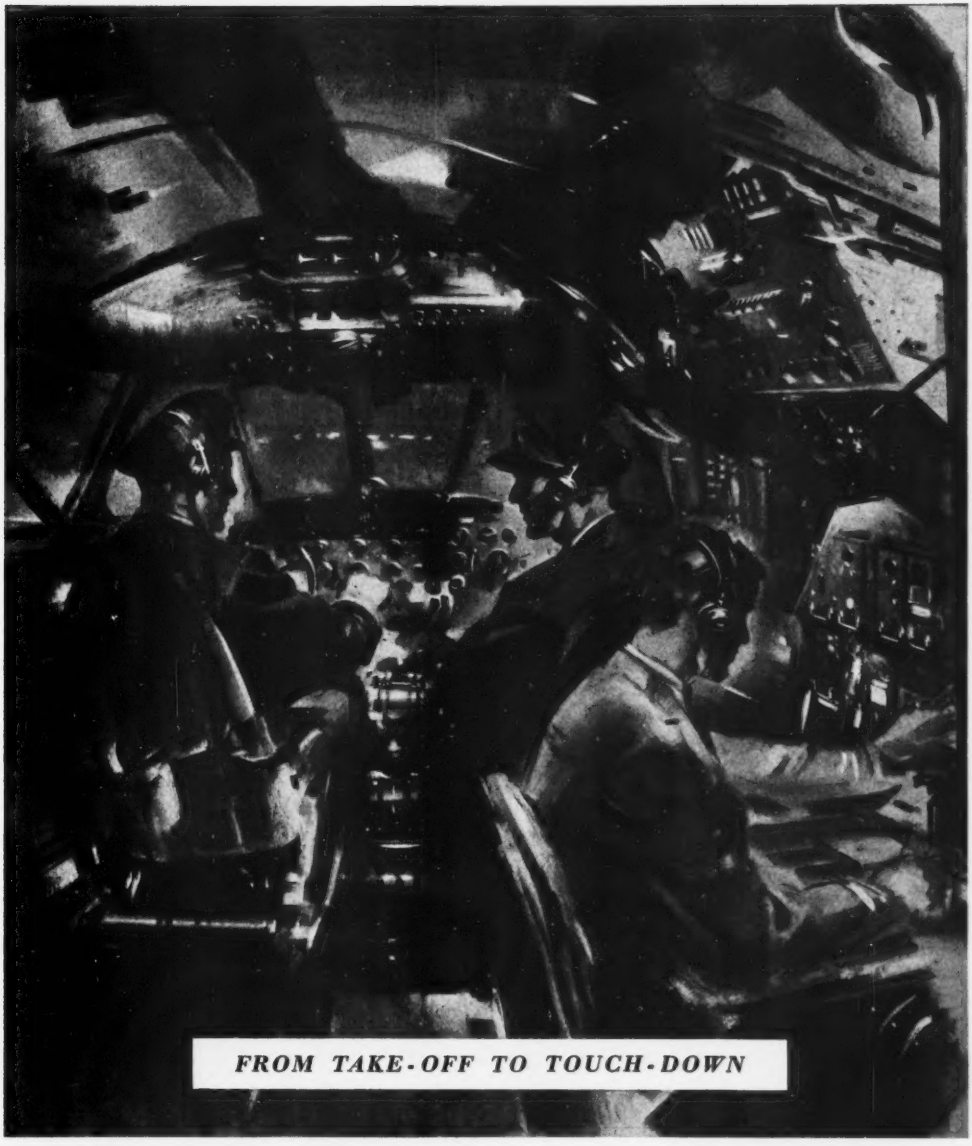
"Flight" Photograph

This Firefly is not so close to the edge as it appears, but the rating on the tail-arm has to know what he's about.

The process of catapulting aircraft is, briefly, as follows. As in the free take-off case, the aircraft will be spotted in vics of three at the after end of the flight deck, but the first three or four in the take-off sequence will be ranged in line-astern on the starboard side with No. 1 aircraft abreast the forward part of the island, and slewed diagonally to port. From this position, the aircraft is taxied across to the end of the catapult, where the starboard wheel engages a soaped board which facilitates slewing the aircraft to align with the catapult. On being lined up, the aircraft moves forward until both landing wheels butt against chocks; the wire bridle from the catapult trolley is then engaged with the hooks or hook under the fuselage-belly, and the hold-back link is attached. The hold-back function is important in that it is absolutely essential that throughout the pre-launching process, the towing bridle is maintained bar-taut.

As in the free take-off case, the red light at Flying Control is shown when engines are started, and No. 1 aircraft moves across to the catapult when red changes in favour of amber. The pilot having completed his "vital checks", he gives the thumbs up to the Flight Deck Officer who, as soon as he sees the catapult crew have secured the aircraft, and are clear in their safety stations, looks to Flying Control for the green light and, having received it, flags the aircraft (by whirling his flag round his head) up to full boost and full r.p.m. When the pilot is satisfied that his engine is giving maximum power rating, he locks his throttle and holds his left arm vertically in the air for a moment; when the Flight Deck Officer sees the pilot lower his arm, he drops his flag and the Catapult Officer—at the catapult control station at the port deck-edge—simultaneously lowers his flag, and the catapult operator pulls his lever to launch the aircraft. Immediately No. 1 aircraft is airborne, and the catapult trolley is on the way back for the next launch, No. 2 is moving across to be catapulted in turn; the time sequence in a well-trained carrier averages 45 seconds between launchings.

Having arrived back from their operational task the aircraft will form-up, as already mentioned, into a "break-up circuit" in the vicinity of the carrier. On receiving the order "join landing circuit", they form-up into flights of four in line-astern, and fly past the carrier close on her starboard side at approximately 500ft. The first flight will then circuit to port, losing height down to about 100ft and changing formation to echelon to starboard, from which, having once more flown past the carrier close to starboard, they break off



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NAVAL AVIATION TODAY . . .

at 30-second intervals into the down-wind leg. As the first aircraft lands-on, the four aircraft of No. 2 flight are successively breaking off into the down-wind leg. Implicit in this method is the fact that aircraft are landed-on at 30-second intervals (or less).

When the pilot is abreast the carrier on his down-wind leg (180 deg station) he starts his turn-in, and when he arrives at the 90 deg position, that is to say, when the carrier is at 45 deg on his port bow, he looks for the batsman. This officer, whose proper title is the Deck Landing Control Officer, is stationed on a small platform on the port side of the flight deck right aft, and in him is vested virtually the ultimate responsibility as to whether the pilot makes a successful deck landing. The D.L.C.O. holds a pair of yellow "ping-pong bats" with which he gives informative and mandatory signals to the pilot : these signals (illustrated in detail on pp. 464-465) are of a kind as to be virtually self-explanatory.

Immediately the first aircraft has landed, the hookmen dash to the tail to clear the hook from the arrester wire, whereupon the aircraft is taxied forward as quickly as possible, being passed from the guidance of one P.O. director to another stationed along the port side of the flight deck. As soon as the aircraft has passed the safety barriers, these are immediately raised in preparation for the second aircraft which, by this time, will be just about to land-on. As each aircraft is brought aboard it is, therefore, rushed up forward with the absolute minimum of delay, and this, as may be imagined, demands both a high degree of training and no little co-ordination. Having arrived up forward, the aircraft are directed by the Flight Deck Officer to their parking positions, and this, too, calls for some considerable degree of skill, in that if too much space is used up, there simply might not be sufficient room left for the penultimate aircraft to move forward of the barrier, and so allow it to be raised for the final aircraft to land-on.

Having got all the aircraft aboard and parked forward, the next thing is to check for serviceability, after which half of them will be moved aft and refuelled, the remaining half being refuelled at the positions in which they are standing. Those aircraft which have been rendered unserviceable are "struck down" to the hangars, and are replaced by serviceable machines : refuelling completed, the forward aircraft are moved aft and re-spotted for take-off preparatory to being re-armed. As already mentioned, the turn-round time for this sequence of operations is critical, in that the whole routine must be completed and the aircraft once more become airborne before the aircraft which have returned from the second strike can be brought in. In this connection, if emergency conditions arise—such, for example, as an aircraft crashing on landing and so preventing the remainder of the formation landing-on—it is imperative that they get down without too much delay, for they may not have sufficient fuel left to wait until the deck is clear, particularly if the crash has been really serious. In such circumstances, it is usual in a task group to have one carrier as a "spare deck", this more often than not being, during the day, a carrier which is normally working night ops, or *vice versa*. There are, of course, a number of other emergency conditions which can arise, and which have the same ultimate effect, but that cited is sufficiently representative to point the problem.

Sufficient has been said to make it clear that the whole business of flying aircraft from carriers demands the most highly organized training on the part of, literally, every single man concerned. Not to put too fine a point on it, the Naval pilot has to be an absolutely first-class man at his job, and he is not alone in this. Every man-jack of a carrier's ship's company has to be up to scratch; there is simply no room for the second-rate in Naval Aviation.

Having thus briefly reviewed the essentials of aircraft operation from carriers, and given a synoptic survey of task force and task group structure, we must now examine the shore-based foundations which back up the sea-going effort and make it all possible. As shown in the chain-of-command diagram on page 483 of this issue, these foundations are vested in the Home Air Command, the C-in-C. of which is the Flag Officer Air (Home), with headquarters at Lee-on-Solent. It is manifestly impossible to give a complete picture of everything that goes on at all the Naval Aviation shore establishments, and there is little doubt that the most expeditious method of presenting a broad perspective of the Home Air Command is to divide it up into its three component branches, in order to survey the work of those branches as typified by the activity at selected stations and establishments which can be taken as being representative of the greater number. We will deal first with Ground Training,

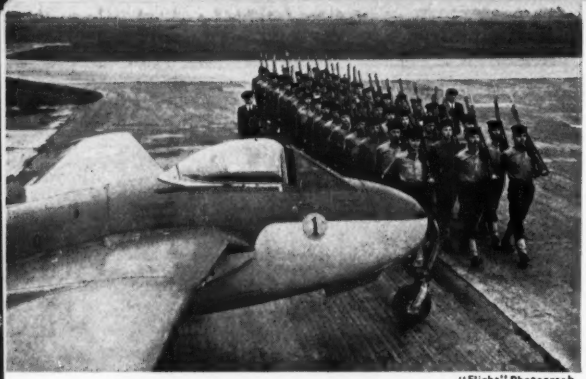
Naval airmen ratings training at Lee for the Royal Tournament field-gun competition. The all-time record is held by Naval Aviation.

Co-education on a Derwent in the Pilot's Mates' course at Yeovilton.

"Flight" photographs

Wren air mechanics training at Yeovilton. The Sea Vampire shown was the first jet aircraft in the world to land on a carrier deck.

NAVAL AVIATION TODAY . . .



"Flight" Photograph

Ceremonial and disciplinary training, Air Ordnance School, Yeovilton.

"Flight" Photograph

Aircraft handlers have instruction on the dummy deck at Gosport.

"Flight" Photograph

The first duty of Naval Aviation fire parties is aircrew rescue: fire-killing comes second. (Below) The Safety Equipment and Survival School at Gosport have developed this "bosun's chair" harness, in which a man can be lowered from a helicopter to rescue a survivor by fastening a snap-hook into the straps of the rescued man's flotation jacket.

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then go on to Flying Training, and finish up with the Reserve Aircraft Command.

Before continuing, it should be explained that, although an air station may be concerned chiefly with personnel training and thus come under the administrative authority of Flag Officer Ground Training, it may have a flying task as well; if so, then for the execution of that section of its activity the commanding officer is responsible to Flag Officer Flying Training: by the same token, reserve aircraft might be stored in spare hangars on the station, and in this instance, the Rear-Admiral Reserve Aircraft is the authority concerned.

Ground Training H.Q. is at Lee-on-Solent, as are the R.N. Barracks for Naval Aviation as a whole; in this latter context, Lee is the home depot of naval airmen and, as such, is the virtual equivalent of the (ship) depots at Portsmouth, Devonport and Chatham. When a man joins the Navy and elects to enter Naval Aviation, he first goes to Lee—unless he opts for the electrical side of aviation, in which case he goes to H.M.S. *Collingwood* (Fareham). From Lee, the newly-joined Naval airman goes to Bramcote (H.M.S. *Gamecock*) for new-entry training in whatever trade he decides to take up. Having completed his initial training, he goes to sea in a carrier for six weeks in order to obtain preliminary sea experience, thereafter coming back to Lee prior to being drafted to his specialist training at Bramcote, Yeovilton, Ford or Gosport. The embryo electrical rating, having completed his initial training at *Collingwood*, goes straight to H.M.S. *Ariel* (Warrington) from where, as a fully trained electrician (air) he is drafted to a carrier or a shore establishment; his records, however, are dealt with at Lee and thereafter, in common with all other Naval airmen, Lee is his "home" throughout his Naval career.

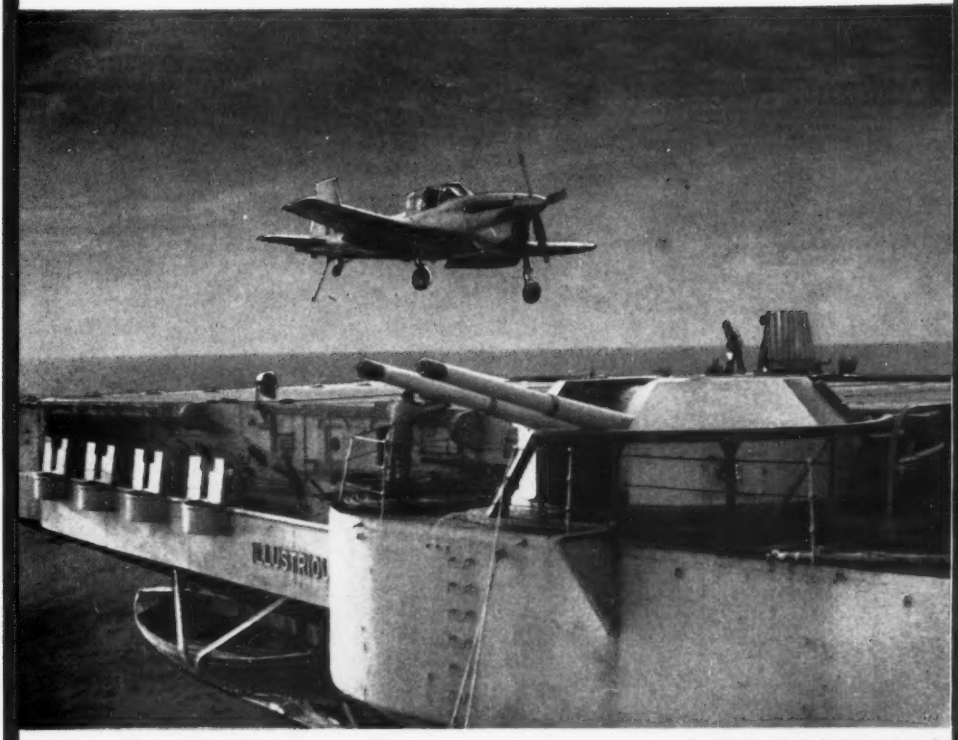
Naval Aviation ratings are given the title of "Naval airmen" and their relation to the traditional naval rates are as follows: Naval Airman 2=Ordinary Seaman; Naval Airman 1=Able Seaman; Leading Airman=Leading Seaman; P.O. Airman=Petty Officer; Chief Airman=Chief Petty Officer. In the electrical branch, the rating equivalents are respectively: Electrician's Mate (Air) 2; Electrician's Mate (Air) 1; Leading Electrician's Mate (Air); Electrician (Air); and Chief Electrician (Air). In the Royal Navy, an artificer is the most highly skilled rating, in that a prerequisite to the lowest artificer category (5th class) is a four-and-a-half year apprenticeship either in the Navy or in civilian life. In rating, an Artificer 5th class is the equivalent of a Leading Airman. After 12 months, the man automatically becomes an acting 4th-class Artificer (petty officer rate) and then, after a further three years, can become (by examination) an Artificer 3rd class (C.P.O. rate). As an Artificer 3rd class, the man's promotion to 2nd class and 1st class is automatic in time, but he can short-circuit this by taking an examination to become a Chief Air Artificer.

The rate categories listed apply broadly to all the trades open to Naval airmen, viz., aircraft handler; safety equipment; photographer; meteorological observer; and airman mechanic (A), (E) and (O); these suffixes refer respectively to airframes, engines, and ordnance. The keen airman mechanic has, however, an opportunity for advancement which is not available to other categories, in that he can train in all three trades—(A), (E) and (O)—plus electrical, radio and radar, to become a Pilot's Mate. There is also another outlet to even greater advancement, which is available only to the airman mechanic (and, *ipso facto*, pilot's mates); this is through the non-substantive rate of aircraft mechanician. Treating the air mechanic as semi-skilled, and the artificer as fully skilled, the outlet of mechanician is a method whereby an air mechanic can transfer to, and become, in effect, an artificer. It means that he takes what is virtually an apprenticeship of ten years as against the artificer's preliminary four-and-a-half years but, on the other hand, if he elects, as a pilot's mate, to go on to become a mechanician, he gets there in five to six years.

Naval air mechanics (A) and (E) receive their specialist training at Bramcote, whereas electrical (air) ratings do their

(*Continued on p. 463, after "H.M. Aircraft Carriers" colour feature*).

BALLIOL goes to sea.



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FROM ITS INCEPTION, the design of the Balliol has incorporated the features necessary to render it suitable for naval use. Folding outer wings enable it to be stowed on carrier vessels, the rear fuselage is designed to take a standard arrester hook and the long-stroke undercarriage units provide ample shock-absorbing capacity for deck landings. Its high performance and first-class control characteristics combine to make the Balliol an ideal aircraft for advanced naval training

BOULTON PAUL AIRCRAFT LTD., WOLVERHAMPTON

E

H.M.S. INDOMITABLE

Key to numbered annotation.

1 Workshops
2 Washplace
3 Messes
4 Messes
5 Ship's office
6 Boiler-room air intakes
7 Parachute drying room
8 Messes
9 Petty officers' mess
10 Messes
11 Paravane bays
12 Wardroom
13 Wardroom pantry
14 Wardroom galley
15 Boiler vents
16 Bakery
17 Lt. Cdr. (Flying) cabin
18 Cabins
19 Canvas store
20 Cable store
21 Ship's company recreation flat
22 Messes
23 Annexe
24 Communications office
25 Canteen-staff mess
26 Locker flat
27 Bathroom
28 Passage
29 Bathroom
30 Hydraulic room
31 Cabins
32 Hangar canteen
33 Sick bay
34 Routine office
35 [illegible]
36 [illegible]
37 [illegible]
38 [illegible]
39 [illegible]
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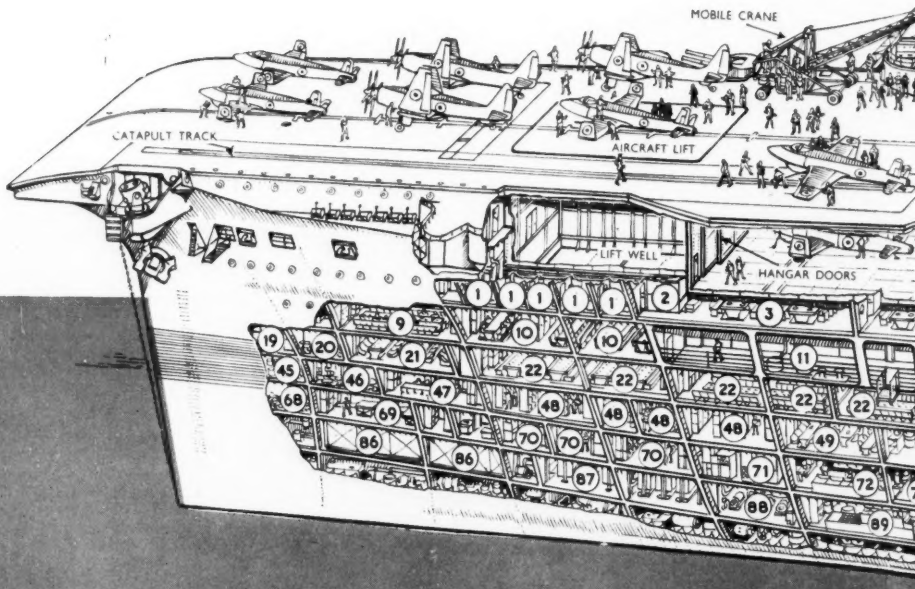
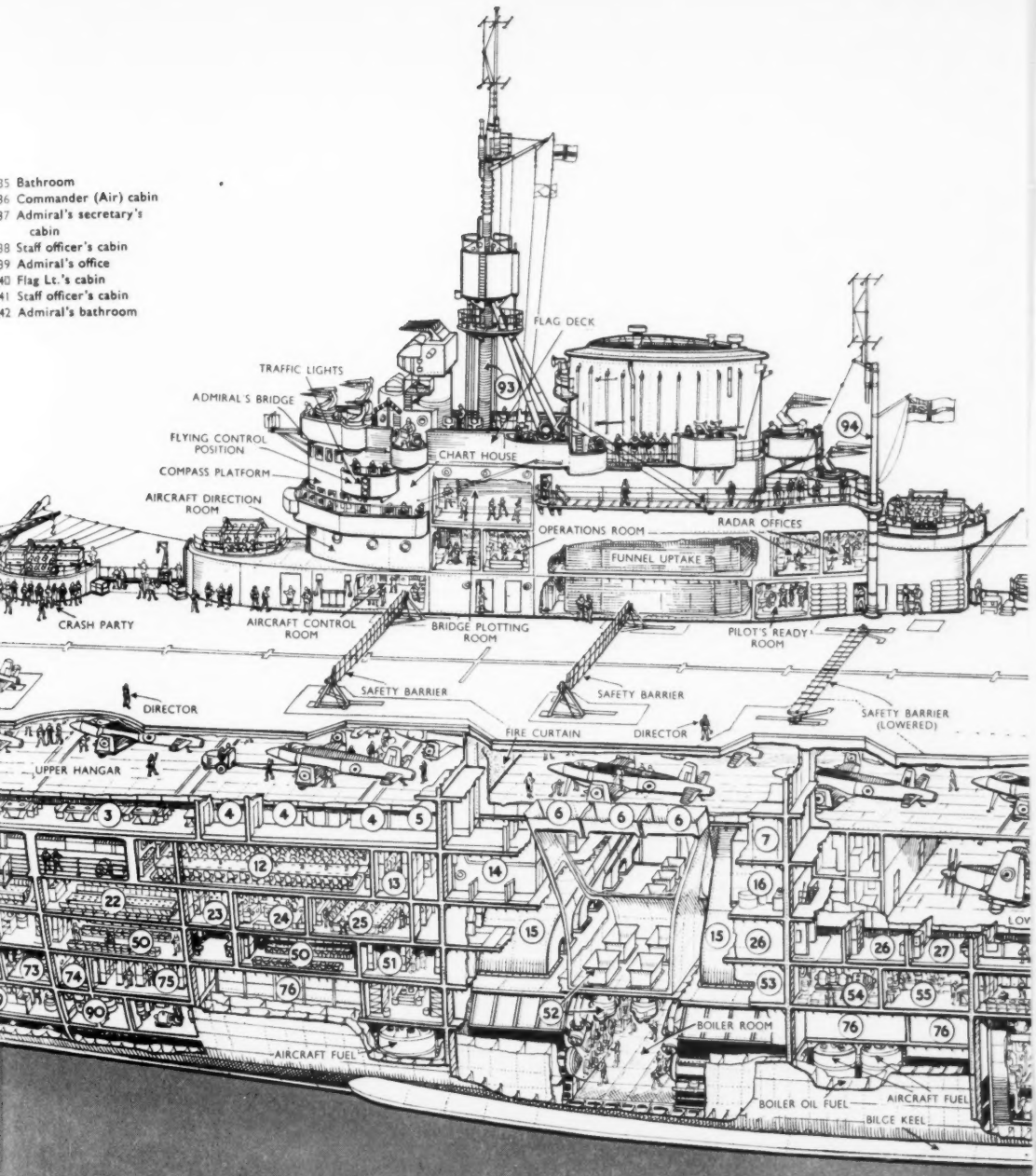
41 [illegible]
42 [illegible]



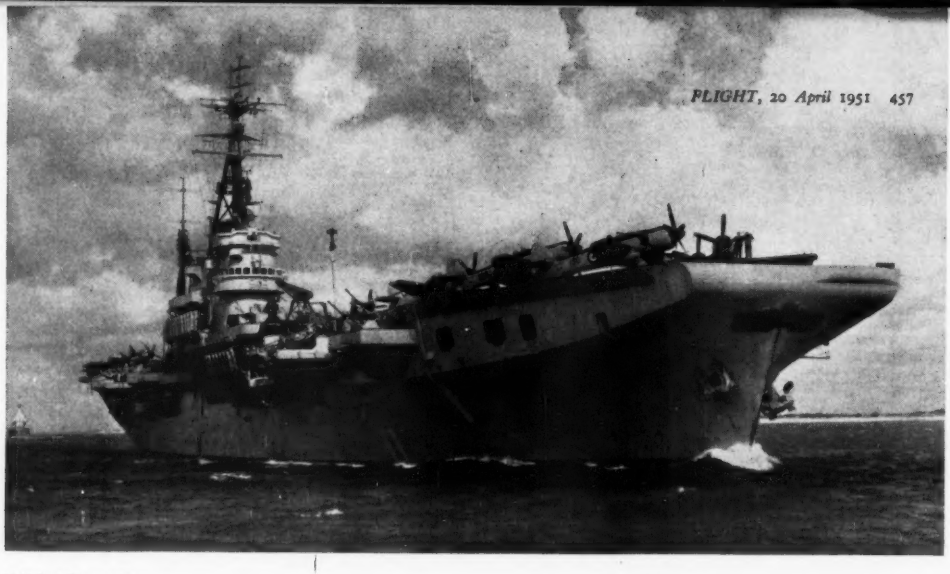
Although there are manifest differences in detail design, the basic arrangement of all British carriers is the same. In essence the carrier is, of course, nothing more than a highly compact air station mounted aboard a ship. Aside from the air station, the carrier is much like any other warship with its mess decks, stores, cabin flats, engine room, workshops and so forth. Superposed on all this, however (and to some extent surrounded by it), is the hangar accommodation, with its attendant storerooms and workshops, the whole being topped off with the flight deck. Slightly forward of amidships, and on the starboard side of the vessel, is the "island", a structure housing the operational executive offices of the ship, the funnel, masts, and radio and radar antennae. The flight decks of British fleet carriers are of armour-plate (by contrast with the American practice of using wooden decks with a "strong deck" underneath), and although the problem of aircraft skidding is rather acute on a steel deck, the security which such construction offers in other respects, is, to say the least, a comforting feature. Along each side of the flight deck are safety troughs, operating stations for deck gear, walkways and the A.A. gun sponsons.

At the extreme forward end of the flight deck is the catapult —a hydraulically actuated trolley running along a slot in the deck in order to accelerate an aircraft to flying speed in a distance of something over 100ft. Each light fleet carrier has its catapult on the port side of the flight deck, but the new fleet carriers will be equipped with a pair, one each port and starboard.

35 Bathroom
36 Commander (Air) cabin
37 Admiral's secretary's cabin
38 Staff officer's cabin
39 Admiral's office
40 Flag Lt.'s cabin
41 Staff officer's cabin
42 Admiral's bathroom



Across the flight deck, abreast the island, are the crash barriers, which are always raised when an aircraft is landing, and rearward of these the after two-fifths of the flight deck is straddled by a number of arrester wires, the number of which varies according to the class of carrier. The arrester wires are specially flexible pre-laid steel ropes, which are rove in pairs at 12 : 1 ratio to single cylinder-units. The hydraulic fluid is a 50/50 mixture of water and glycerine, and displacement of this fluid by movement of the piston is progressively restricted so as to give a constant deceleration rate. Of the ten arrester wires in a light fleet carrier, the first eight have a maximum pull-out of 154ft, whilst the final two have a maximum travel of 128ft. Raising, lowering and re-setting the wires is controlled remotely from a station at the port side of the flight deck abreast the after lift. The wires, incidentally, are normally raised a few inches above the deck, being so



H.M.S. "Theseus"

H.M. AIRCRAFT CARRIERS

A Review of Britain's Sea-Going Air Bases

FOR centuries, the essential rôles of the various classes of fighting ships remained unchanged. As sail gave way to steam, ship design changed and new names were coined for the new types, but the intrinsic composition of a fleet did not alter; the main weight of attack was concentrated in the battleships, supported by the cruisers, whilst destroyers, frigates and the other smaller types acted in scout, lure and such-like rôles. This is, of course, an over-simplification with which any naval purist will be inclined to quarrel, but for the purpose of laying down the fundamentals of fleet composition, as they existed up until comparatively recent times, it will serve well enough.

The changed character of the fleet today is primarily a result of one thing—aircraft. Their advent introduced the aircraft carrier; not immediately, of course, but fairly quickly. It was, in fact, only seven years after the Wright Brothers' first flight that an aircraft was flown-off a ship. At the most, therefore, the "aircraft-operating ship", is only just over 40 years old; but those four decades have seen a unique metamorphosis of naval operation. No other single class of ship has undergone so great a change in operational concept in so short a time as has the aircraft carrier; in less than 40 years, it has climbed from the lowly category of fleet attendant to its present primacy. The reason is simple: the carrier has merely reflected the development of aircraft, and as aircraft became more and more powerful as weapons, and steadily increased their operational capacity, so the carrier followed-up.

The carrier, *per se*, is not a fighting ship; its sole purpose is to facilitate the operation of aircraft. The importance of this function in naval warfare today is implicit in the leading position accorded the carrier in the fleet. In being displaced from its traditional primacy, however, the battleship has by no means become obsolete, despite the proselytising of many Naval Aviation enthusiasts. Battleships are still an immensely powerful and indispensable factor in maritime warfare, but the crux of the whole matter is that their weapon, the large-calibre gun, is too short-ranged by comparison with the relatively enormous range of the airborne weapon. The inherent operational flexibility of aircraft—reconnaissance, fleet and convoy protection, anti-submarine duty and army support, to mention only a few examples—these are the essentials of the argument for making the carrier the number one of the fleet: a break with age-old traditions which the Admiralty has comparatively recently decided to follow.

At the present time, the Royal Navy has six fleet carriers, the 32,110-ton H.M.S. *Implacable* and *Indefatigable*; the 29,730-ton *Indomitable*; and the *Formidable*, *Illustrious* and *Victorious*, of 29,240, 31,790 and 29,110 tons respectively. Of these, *Indomitable* is in service with the Home Fleet as flagship of the C-in-C., whilst *Illustrious* is serving as a trials carrier. These 30-knot big ships are supplemented by six light fleet 18,000-ton carriers of the *Glory* class (*Glory*, *Ocean*, *Theseus*, *Triumph*, *Vengeance*, *Warrior*) all of which are in service, *Triumph* having just returned from Korea, whilst *Theseus* is still doing a magnificent job in that theatre. In addition to these 24-knot ships, there are also three specialist light fleet carriers, two of which (*Perseus* and *Unicorn*) are designed for aircraft maintenance and ferry duties, whilst the third (*Campania*) is normally a ferry carrier, but at the moment is in the final throes of preparation as a floating exhibition section of the Festival of Britain.

In addition to the fleet and light fleet carriers enumerated, two 45,000-ton large fleet carriers, *Eagle* and *Ark Royal*, are in an advanced stage of completion and, in fact, *Eagle* is now undergoing her acceptance trials. Four improved light fleet carriers of the *Hermes* class (*Hermes*, *Bulwark*, *Centaur* and *Albion*) are also in course of construction, and are due to go into service by 1954. These four ships are of about 23,000 tons and will be capable of a speed of some 30 knots.

The accompanying drawing of H.M.S. *Indomitable* gives a remarkably comprehensive illustration, not only of the layout and general composition of a fleet carrier, but also the innate complexity of these vessels. The drawing actually shows *Indomitable* as she was before her recent re-fit and modernization. Fleet carriers both in the *Implacable* and *Illustrious* classes each accommodate approximately 60-plus aircraft but, of course, this number depends in the event on the type and size of aircraft embarked. By the same token, the existing light fleet carriers can each nominally accommodate 40 aircraft, whilst the new light fleet *Hermes* class ships are designed for a complement of 50 machines. By contrast, *Eagle* and *Ark Royal* each has the capacity for a four-squadron Air Group, and can accommodate 100 aircraft. These figures, it must be pointed out, are not for hangar capacity alone; it is normal operational practice for a "deck-park" of aircraft to be carried as well.

(*Continued overleaf*)

"Flight" photographs

Sea Fury taking-off from H.M.S. Vengeance. It is noteworthy that the rear barrier is already fully raised and the forward barrier is on the way up before the aircraft has actually become airborne.

H.M. AIRCRAFT CARRIERS . . .

Aircraft are moved between hangars and flight deck by means of large, electrically actuated lifts, one forward and one aft. Whilst on the flight deck, the aircraft are the immediate responsibility of the Flight Deck Officer, under whose direction they are moved, ranged, struck down, and prepared for take-off. The Flight Deck Officer is in charge of the deck crew, comprising the aircraft handlers, fire party, crash party and hook-men, and for this purpose has, in addition to manpower, "Clarkat" tricycle tractors of astonishing power and manoeuvrability, a mobile crane and, of course, fire-fighting equipment.

The stowage and movement of aircraft in the hangar, fire safety in the hangar and, in fact, virtually everything that goes on there, other than maintenance work on the aircraft themselves, is the direct responsibility of the Hangar Control Officer. Aircraft are stowed with brakes on and hook grounded and are secured by lashings to ring bolts in the deck. Naturally enough, fire precautions are invested with overriding importance. All access to the hangars (other than by the aircraft lifts) is through air locks to give air-isolation conditions in case of fire. The hangars are divided into separate volumes by asbestos fire-curtains, and are forced-draught-ventilated, fresh air coming in at the top, whilst foul air is fan-extracted at the bottom and evacuated direct to atmosphere, carrying with it any petrol fumes, oil mist or such-like combustible mixture which might otherwise linger. Beneath the deck-head are sprinklers, and in the corner of each hangar are scuppers which take away heavy rain-water (or sprinkler delivery). Oil drained from engines is disposed of through sumps in the hangar access lobbies, which drain to a central collector tank whence the oil is cleared and used for ship—as opposed to aviation—purposes.

Aircraft fuel is stowed below the water-line in a great many water-jacketed tanks and, at request, is pumped (by compressed air) up to the hangar and/or flight deck by the ship's engineers.

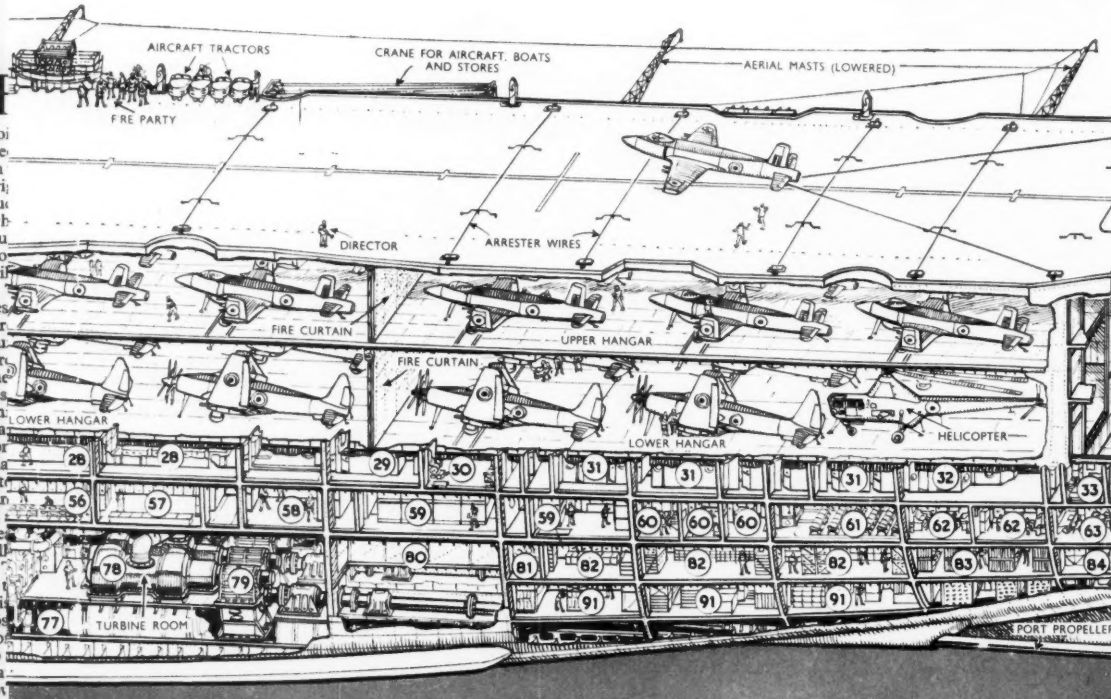
Necessarily, the spare components, both major and minor, which are required to keep anything from 30 to 80 aircraft at a state of operational serviceability take a good deal of stowage space. There are, too, the workshops necessary for engine and airframe servicing and maintenance. All these are grouped in the immediate vicinity of the hangars, and the areas of the hangar walls and deck-heads are also put to good use; for example, mainplanes, tailplanes, and elevators are stowed in cradles immediately beneath the deck-head. Airscrews are stowed on the walls, whilst drop-tanks are slung from bomb slips on rails beneath the deck-head along the port and starboard walls.

It is a fascinating experience for anyone used to the spacious scope of an air station—with its echoing hangars, mile-long runways, and dispersal sites—to visit an aircraft carrier and discover within its confines hangars, runway, fuel stores, armament magazines, galleys, messes, a bakery, a laundry, prison cells, a power station, radar rooms, a church, decks and flats in bewildering variety, and all the gamut of things one has ever heard of in connection with a ship. Surely the Naval airman is doubly fortunate: he is lucky enough to have the best of both worlds. C.B.B-W.

Fireflies, Sea Furies and Seafires spotted for take-off in vics of three. The flight-deck officer has just given the "start engines" signal.

43 Admiral's spare sleeping cabin
44 Admiral's day cabin
45 Paint store
46 Cable store
47 Kit locker
48 Kit stores
49 Recreation flat
50 Seamen's bathroom
51 Locker flat
52 Boiler room vents and fans
53 Compressor room
54 Turbo-generator
55 Engineers' workshop
56 Bathroom
57 Locker flat
58 Workshop
59 Naval store
60 Offices
61 Church
62 Offices
63 Air Group office
64 Pay office
65 Link trainer room
66 Buzzer room
67 Captain's cabin
68 Cable locker
69 Clothing store
70 Flour stores
71 Store
72 Photo-printing room
73 Photo-devel
74 Sports store
75 Ship's coy l
76 Naval stores
77 Turbine con
78 Port high- a sure turbi
79 Turbine red

THIS remarkable drawing by Max carrier. For purposes of clarity, rather more spaciously than would informative as possible, several f Attacker is shown on the catapult, pointed out that this drawing sho



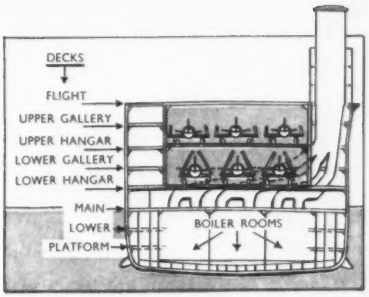
lifted by silicon-manganese bow-springs, which are pulled down (to lower the wires) by compressed-air piston/cylinder units.

The crash barriers are essentially similar to the arrester wires, each barrier consisting of a "fence" of steel wires, slung between articulated arms whereby the barriers can be raised and lowered. Like the arrester wires, the barriers can also be pulled out by an aircraft (or anything else, for that matter) running into them, but the maximum pull-out distances are considerably less than apply in the case of the wires. The barriers are remotely controlled from the (port) deck edge midway between them.

leveloping room
store
oy locker flat
tores
condensers
gh- and low-pres-
turbines
reduction-gears

80 Stores
81 Oxygen store
82 Stores
83 Flour store
84 Stores
85 Steering-gear machinery
86 Fresh-water tanks
87 Cold rooms

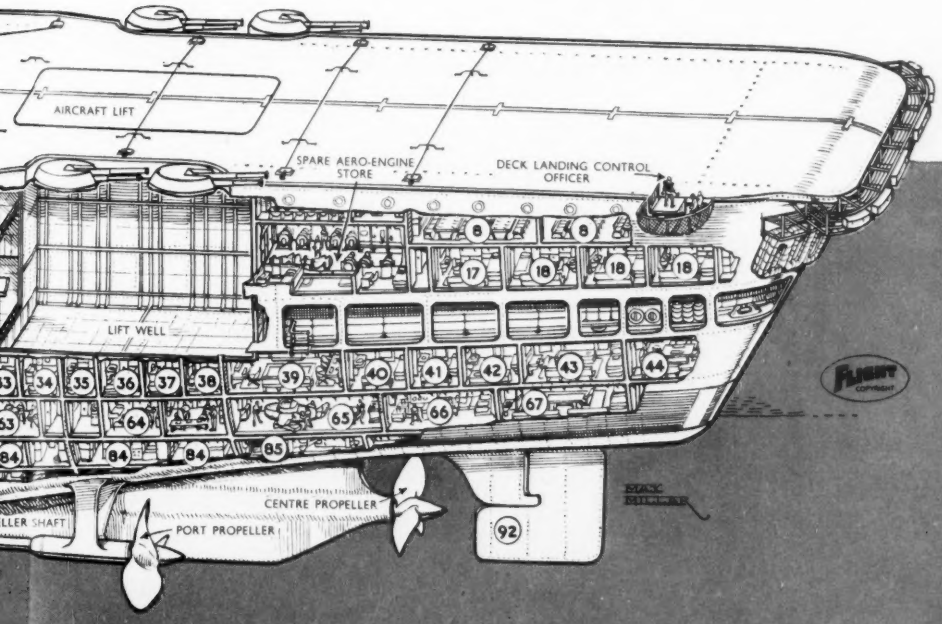
88 Machine space
89 Canteen store
90 Oil fuel settling and recovery
91 Stores
92 Rudder
93 Mainmast
94 Radar mast



Full-load tonnage	...	29,730
Length O.A.	...	754ft
Beam	... ...	95.75ft
Draught	... ...	29.5ft
Cruising range	...	6,000 miles
Speed	... ...	31 knots
Propelling machinery	...	Parsons geared turbines, 110,000 h.p. 3 shafts
Auxiliary machinery, steam and Diesel		3,000 Kilowatts
Ship's oil fuel	...	4,800 tons
Aircraft fuel	...	75,000 gallons
Ship's complement		1,600
Aircraft	... ...	Up to 80

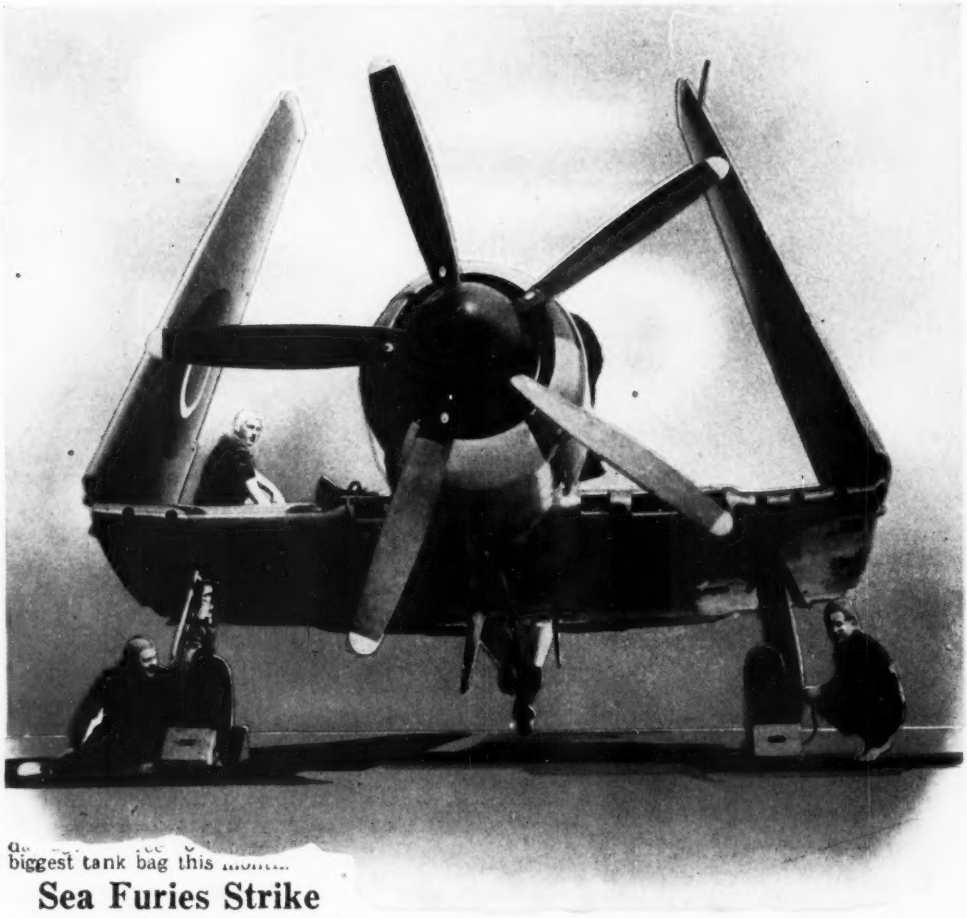
Max Millar shows very clearly the size and complexity of a fleet aircraft ty, the Attackers and Wyverns shown in the hangars are spread out ould normally be the case, and, purely in order to make the drawing as al flight-deck conditions have been merged. Thus, for example, an ult, whilst a forward deck-park of aircraft is ranged. It should also be shows H.M.S. "Indomitable" as she was prior to her recent re-fit.

A



The catapult mechanism is a virtual reversal of that used for the arrester gear, in that the catapult trolley is actuated by a cylinder/piston unit through a system of rope reevings to give an 8 : 1 magnification of piston travel. The system is basically pneumatic, the pressure of air admitted to the cylinder being adjusted to give the trolley speed required for the weight of the particular aircraft being launched. A rough rule in this context is 1 lb/sq in air pressure for each 10 lb of aircraft weight. Having launched the aircraft, the trolley is returned by admitting water-glycerine to the cylinder in order to re-compress the air.

(*Continued overleaf*)



biggest tank bag this

Sea Furies Strike

Sea Fury fighter aircraft of the Royal Navy made their first operational sorties when they attacked military targets at Chinnam' Po, port for Pyonyang. With Firefly machines they operated from the light fleet carrier Thesus which is relieving H.M.S Triumph. due to return to Britain.

The aircraft att

...powered by CENTAURUS

The 450 m.p.h. Sea Fury is one of the fastest piston engined aircraft in the world. It is in service with the Royal Navy, The Royal Canadian Navy, the Royal Australian Navy, the Pakistan Air Force, the Royal Netherlands Navy and in Egypt and Iraq.

Powered by a 2550 h.p. "Bristol" Centaurus 18 sleeve-valve engine the Sea Fury has an excellent take-off performance, low fuel consumption, long range and endurance, features which make it very suitable for operation from aircraft carriers. Production of the Sea Fury continues...

Bristol CENTAURUS ENGINES POWER SEA FURIES

THE BRISTOL AEROPLANE COMPANY LIMITED ENGLAND

929

NAVAL AVIATION TODAY . . .

(*Continued from page* 456)

"Flight" photographs

Simulating the installations in Firefly aircraft, this radar training "set-up" is at the R.N. Air Signals School.

qualifying, advancement and conversion courses at H.M.S. *Ariel* (Warrington). Aircraft artificers and aircraft mechanicians are trained at Arbroath (H.M.S. *Condor*). The leading airman mechanic (A), (E) and (O) and the pilot's mate courses are undertaken at Yeovilton (H.M.S. *Heron*), where also the specialist training of Wren air mechanics is given; it is relevant to observe here that Wren air mechanics are also eligible for training as pilot's mates, and we cannot help reflecting that, in this connection, the choice of title for this trade was somewhat short-sighted. Yeovilton also accommodates the School of Aircraft Maintenance, through

The Naval Air Medical School is responsible, among other things, for the specialist clothing of naval aviation personnel. Shown here is the latest type of immersion suit for naval aircrew.

which short-course training in individual types of aircraft, engines and electrics is given to ratings of any grade as well as to officers. Another feature of Yeovilton is the Air Ordnance School. Guns and ceremonial have always gone together in the Royal Navy, and just as Whale Island has for decades been the mother school of gunnery and ceremonial for the Navy as a whole, so now the Air Ordnance School at Yeovilton is carrying on the Whale Island tradition for naval aviation. As such, the School is responsible for the morale, ceremonial and disciplinary training of all ratings who are drafted to Yeovilton quite aside from its function of providing specialist training for naval airmen mechanics (O).

The naval airman aircraft handler receives his specialist training at Gosport (H.M.S. *Siskin*) which, it is worth recalling, has had a continuous history of 40 years' connection with Service flying. In 1912, Gosport was chosen as the site of one of the first five stations to house the Royal Flying Corps, and in 1914, the first squadron of the Royal Naval Air Service ever formed was quartered there. Today, among its other activities, Gosport is the home of the R.N. School of Aircraft Handling. In point of fact, the School headquarters are in Fort Rowner, one of two (the other is Fort Grange) forts erected during the Napoleonic wars as part of the defence chain around Portsmouth, and known as "Palmerston's Folly". The aircraft handler has to have not only good physique, but also above-average intelligence, for in addition to the basic duty of handling aircraft, he is also required to be proficient in the technique of aircraft fire-fighting, both ashore and afloat, and also in air traffic runway control. On the airfield at Gosport is laid a concrete dummy deck alongside which a pair of buses converted to do duty as an island complete with flying control carry a "ship's badge" emblazoned with the name *Spurious* and the motto *Nunquam dic prangem*. Here, using actual aircraft, the embryo aircraft handler learns his trade. In naval aviation, it is emphasized that the first duty of the fire-fighting party is aircrew rescue; fire-killing comes second. This, one would imagine, would be the normal state of affairs in all flying organizations but, we were assured, such is not the case, and the Navy feel that they are giving a lead in this direction. The Aircraft Handling School have modified a standard Monitor crash tender to be operated by one man (plus driver) and have thus effected an advance over normal practice. Owing to the poor cross-country performance of the standard Monitor, however, the School introduced a modified Land Rover as a quick rescue vehicle. This is manned by a crew of three (including the driver), who wear fully protective clothing, including an ingenious piece of headgear which is basically a miner's type helmet fitted with an asbestos cowl and a large, non-fogging vizor. The Land Rover is equipped with four manifolded 12-lb CO_2 bottles which can deliver either singly, in pairs, or all four together through a discharge horn, this being purely for rescue coverage. In addition, there is a 40-gallon foaming apparatus together with a diversity of rescue appliances including a light-weight ladder, crowbar, pickaxe, etc. We give these details at some

Sea Furies belonging to the 52nd Carrier Air Group based at Culdrose.

NAVAL AVIATION TODAY . . .

length because the Royal Navy has a number of air stations as well as carriers, and because the developments mentioned are prototypes which would seem to be well worthy of general adoption.

Air traffic control is taught by the use of model airfields complete with lighting schemes and, with these, walkie-talkie sets and model aircraft are used in what can be likened to an operational game. The game element comes in when events are purposely muddled so that it is up to the trainee controller to use his initiative to sort things out.

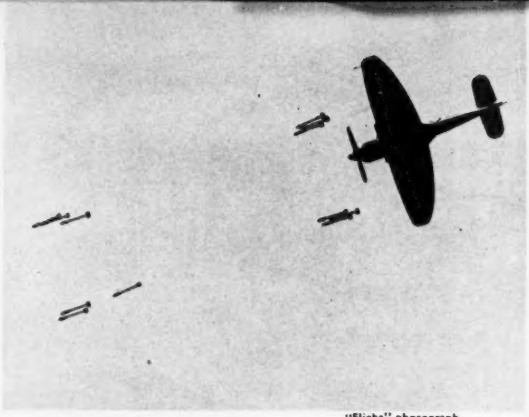
Gosport is also the home of the Safety Equipment and Survival Training School, where naval airmen (SE) receive their trade instruction. The school also conducts training courses for Safety Equipment and Survival Officers, is responsible for the evolution of emergency drills for naval aircraft, and the development and trials of safety and survival equipment and instructional apparatus. To some extent, the Safety Equipment and Survival School has common interest with the Naval Air Medical School at Fort Rowner—in the matter of protective clothing and equipment, for example. As may be expected, the Medical School has close liaison with the R.A.F. Institute of Aviation Medicine, but does not overlap the Institute's work except in so far as is unavoidable. In general, the Medical School is concerned with the purely naval aspects of aviation medicine and it is, for example, one of its duties to test all naval aircrew for high-altitude adaptability, and this is conducted in the school's dockyard-built decompression chamber.

Naval airmen photographers go through their training at the Royal Naval School of Photography at Ford (H.M.S. *Peregrine*). In addition to the basic course for ratings, advanced courses for petty officers are also given, as are courses (for commissioned officers) in the theory and practice of photography, air photography and organization. Naval airmen meteorological observers receive their specialist training at the School of Naval Meteorology, Kete, and a prerequisite to candidature for the meteorological observer 3rd class is that the rating shall have had six months as a naval airman 2 plus a recommendation. A high standard of intelligence is required. Advancement to leading, P.O. and chief rating is also dependent upon oral, written and practical examinations undertaken by qualified meteorological officers.

"Back-seat" Training

Thus far the main elements of ground training; there are also, of course, other specialized courses which do not come precisely under a trade category such, for example, as the Naval Air Signals School, which is close to Lee-on-Solent. From its inception, the main purpose of the School has been the training of "back-seat" aviators in air communications, airborne radar and radio. From time to time, however, classes of non-flying personnel receive air communication familiarization courses, and although the School is essentially an all-male establishment, Wrens from H.M.S. *Mercury* (Leydene) undergo the familiarization courses and D/F instruction. Air instruction is carried out from Hamble in Anson Type C "flying classrooms" operated by Air Service Training, Ltd. Another individual training unit is the Junior Officers' Air Course at Lee-on-Solent. All Sub-Lieutenants, R.N., 2nd Lieutenants, Royal Marines, and Lieutenants, R.N., take the three-weeks J.O.A. Course as part of their normal training. The idea is to give all junior officers some basic familiarity with what naval aviation is all about so that, ultimately, all R.N. and R.M. officers will have at least a nodding acquaintance with naval aviation and the particular problems associated with naval air warfare. As part of the course, flying experience is gained in current operational training types, such as Meteor 7s, Firefly and Sea Fury Trainers.

The headquarters of the Flag Officer Flying Training is at R.N.A. Station, Donibristle (H.M.S. *Merlin*), and it is here that the intending naval pilot gets his pre-flight training. Before this, however, he will have been given an interview and a medical examination, and will have had his aptitude as a pilot assessed at Hornchurch in common with intending R.A.F. pilots. In this context, it is apposite to note that, where commonalty of purpose or equipment exists between the Navy and the Royal Air Force, it is today the policy to make joint use of training or productive



"Flight" photograph

A remarkable photograph, in which the camera has just caught 12 rockets in the course of their delivery by a Sea Fury.

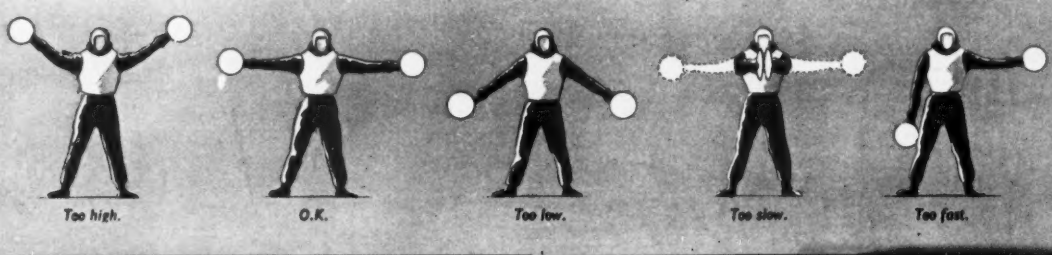
sources wherever practical advantage results from so doing. On the completion of his pre-flight training, the entrant pilot goes to R.A.F. Station, Syerston, where he receives his "all-through' flying training to wings standard under the tutelage of naval instructors. There are, of course, a number of squadrons in naval aviation which, necessary as they are, do not come into the category of operational units—at least, not in quite the same sense as fighter, strike and anti-submarine squadrons. For the purpose of giving a brief outline of pilot-training progress, however, we will assume that the man will ultimately join an air group, and on this premise, he will go from Syerston to the R.N. Operational Flying School at Lossiemouth (H.M.S. *Fulmar*) for conversion to, and training on, operational types of naval aircraft. At the completion of this course, the new pilot proceeds to a training air group for the final part of his operational training, which includes qualifying in deck landings. Thereafter, as an operational pilot, he will go to a squadron forming part of an air group.

One of the training air groups (52nd) is based at Culdrose (H.M.S. *Seahawk*) and, as well as dealing with new pilots from Lossiemouth, who come to be taught weapon training and deck landing, the group also has the duty of teaching air weapon officers and instructors the most up-to-date methods in weapon training. Refresher courses are also given for (basically) fighter pilots who have been away from fighters for some time and, in addition, conversion courses are also run for the various types of fighter aircraft. Each squadron in the TRAG has its own ground instruction organization, and the group incorporates its own maintenance unit. One of the squadrons has 21 Sea Fury 10s and 11s, and four Seafire 17s, whilst the other squadron has similar numbers of the same aircraft plus four Sea Hornet 22s and four Firebrand 5s.

Associated with 52nd TRAG at Culdrose is the headquarters of the CBAL (Carrier-borne Army Liaison) Group. Here, naval pilots are instructed in, and familiarized with, the support requirements of the Army. Army formations, and the recognition of ground equipment, both when camouflaged and dispersed, is given by means of beautifully constructed terrain models, and by illuminated panoramae. Naturally enough, artillery spotting is also taught, and instruction in this and other support duties is facilitated by the use of large terrain models, whereby the pilots can practise map grid-referencing.

Culdrose is also the home of the Jet Evaluation and Training Squadron which, with 52nd TRAG, forms the Naval Air Fighter School. With ten Sea Vampire 20s, and two Meteor 7s, the jet squadron serves to indoctrinate fighter pilots into the high-speed/high-altitude aspects of fighter operation. Navigation, formation, high-altitude tactics, and "snake" climbs and descents are taught in a 30-hour course lasting one month—which is exceedingly good considering the endurance of the aircraft used and the weather factor at Culdrose. Another unit at Culdrose is the 7th CAG (Carrier Air Group) which, formed last November, is now working up prior to embarking in *Vengeance* in May. The group is an entirely "all-weather" operations unit, and comprises two squad-

The main signals given by the batsman to the pilot. Both "cut" and "wave-off" are mandatory; the others are informative.



Naval aircrew are instructed in army support requirements by means of terrain-models in the CBAL section of the Training Air Group.

Some of the Sea Vampire 20s and the two Meteor 7s used by the Jet Evaluation and Training Squadron of the NAFS at Culdrose.

rons, one of Sea Hornet 21s, and the other of Firefly 6s. Pilots of both these squadrons have recently been averaging something over 30 hours' night-flying per month.

Although a flying training unit only in a second-order sense, the Deck Landing Control Officers' School at Yeovilton does so important and unique a job that its work deserves mention in some detail. In order for a batsman to qualify for the ultimate responsibility of bringing pilots in to land on a carrier deck, it is absolute essential that he should himself be a pilot with above-average qualities in deck landing. The intake for the DLCO course is, therefore, derived from above-average pilots at the recommendation of their commanders (air), air group commanders, or squadron C.O.s. The course lasts for eight weeks, which includes six weeks ashore and two weeks afloat in a training carrier, and each course consists of six pupil DLCOs, each of whom, in order to qualify as a batsman, has to bat a minimum of 300 ADDLs (airfield dummy deck landings) and, in addition, has to fly over 100 ADDLs for his five colleagues. Embarked, he bats a minimum of 75 to a maximum of 100 deck landings plus flying a minimum of eight deck landings himself.

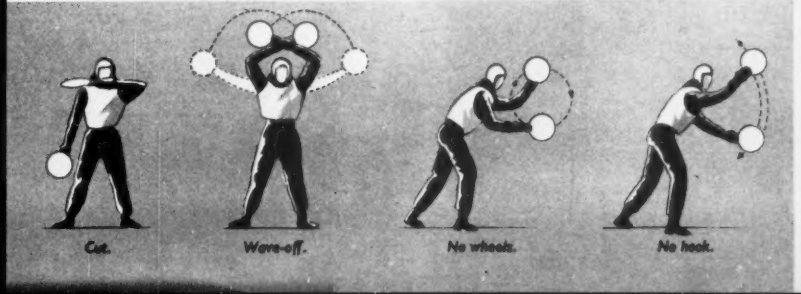
Necessarily, in order thoroughly to teach the pupil batsman his job, it is essential that he has the assistance of expert deck-landing pilots. These are found in the School squadron who, because their working life consists of take-off, circuit and land-on repetition, are known as the "Clockwork Mice". Each clockwork mouse has to be a pilot capable of doing ADDLs and actual deck landings without the aid of a batsman, so as to be able to accept incorrect batting signals, and so show the pupil batsman his mistakes. It is not enough to do perfect deck landings irrespective of signals, for this would not show the batsman's mistakes. The clockwork mouse must, in fact, be capable of flying badly perfectly. The pupil DLCO first does about 20 ADDLs to show the instructors that he is familiar with the system. Thereafter, he bats for the mice, who give him about 50 perfect ADDLs in order to impress on his mind's eye the perfect approach. Then they start making bad approaches and accept his signals and so by a process of illustration and instruction, the efficient deck landing control officer is made.

Another specialist flying unit which must be mentioned is the Service Trials Unit which is based at Ford (H.M.S. *Peregrine*). The main task of the squadron is to undertake intensive deck landing and catapult trials of new aircraft following on the trials carried out at Boscombe and Farnborough. As well as testing aircraft, the S.T.U. also conducts trials on specialist items of equipment, and in addition provides the aircraft (and pilots) for wire- and barrier-pulling and catapult trials of carriers. Safety equipment developed both at the Safety Equipment School and the Air Medical School at Gosport, is also tested by the squadron. The permanent aircraft complement of the S.T.U. is four Sea Hornet 22s; two Sea Vampire 20s; two Avenger 3s; a Sea Fury 10 and 11; a Firefly 4 and 5; two Firebrand 5s; and one Sea Meteor 3. The latter is very much a non-standard aircraft in that it is a Meteor 3 equipped with an arrester hook, Derwent 5 engines but

These Sea Hornet 21s belong to the recently-formed 7th Carrier Air Group which is specializing in all-weather operations.

"Flight" photographs

Glow-worm flares and flash-bomb strikes on the targets by 7th C.A.G. aircraft at Treligga ranges make a very impressive picture.

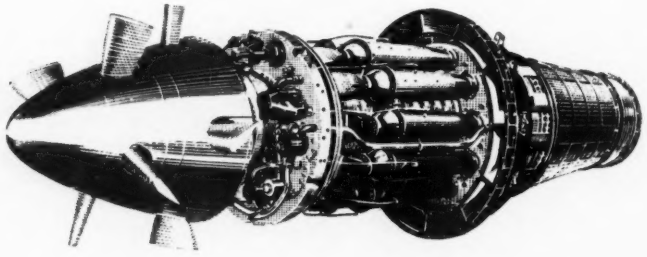


The clockwork mouse mascot of the D.L.C.O. School squadron.

ARMSTRONG SIDDELEY ENGINES

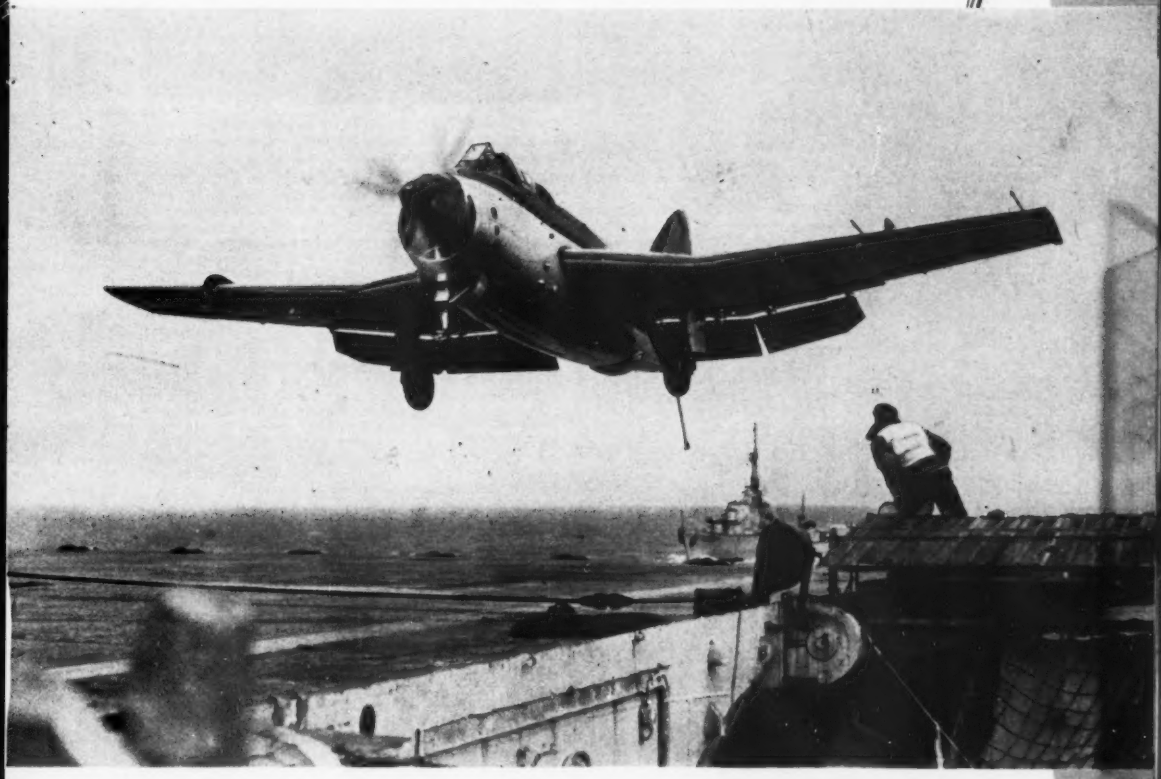
A deck approach and landing calls for superlative judgment on the part of the pilot and complete confidence in his engine. In this, as in every aspect of Naval Aviation, the safety of aircrews depends on the utter reliability of the power unit. In specifying the Fairey 17 Anti-Submarine aircraft and the Westland Wyvern Strike Fighter—the Royal Navy has recognised the advantages of prop-jet engines—high performance coupled with fuel economy, easy maintenance and—because of the lack of vibration—less maintenance.

Armstrong Siddeley | *PYTHON prop-jet.*

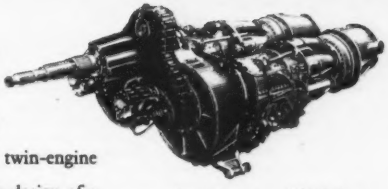


The Westland Wyvern strike fighter—equipped with a 4,110 e.s.h.p. Armstrong Siddeley Python engine.

UNDER THE WHITE ENSIGN



The Fairey 17 anti-submarine aircraft — fitted with an Armstrong Siddeley Double Mamba engine rated at 3,000 e.s.h.p. Ability to cruise on one engine gives the aircraft vastly increased endurance, and when extra power is required the second engine provides full twin-engine performance. The compactness of this unit is a great asset in the design of a carrier-borne aircraft. The Double Mamba was the first prop-jet ever to land on and take off from an aircraft carrier.



Armstrong Siddeley
DOUBLE MAMBA
two engine prop-jet.

ARMSTRONG SIDDELEY MOTORS LTD

Parkside, Coventry.

Members of the Hawker Siddeley Group

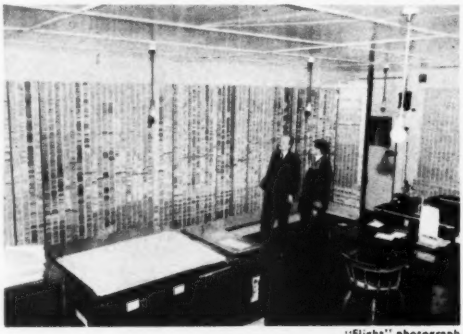
NAVAL AVIATION TODAY . . .

no guns. The squadron expect a couple of Wyverns shortly for deck landing trials.

For Naval Aviation to be truly an entity, it is essential that, to back up the flying units, a large and efficient maintenance and repair organization must exist. Such is Reserve Aircraft Command which, with headquarters at Arbroath, is commanded by a Rear Admiral (E). All new aircraft from the manufacturers go to Receipt and Despatch Units at Aircraft Holding Stations. Here they are equipped for service and have the latest modifications incorporated. From the R.D.U.s, the aircraft are allocated to squadrons, shipped abroad, or placed temporarily in reserve.

It is Admiralty policy that only the more simple work, the periodical minor inspections and small repairs, should be undertaken on the aircraft carriers, and at R.N.A. stations. Aircraft needing more extensive repairs, or due for reconditioning, are returned to Aircraft Maintenance Yards or Aircraft Repair Yards which, in effect, are the naval aviation equivalent of dockyards. There is thus a continuous flow of aircraft between the squadrons and Reserve Aircraft Command, and civilian-manned Naval Ferry Flights, and the Naval Aircraft and Salvage Units (with their specialized transport) move aircraft as required. To avoid delay in supplying replacements, Rear Admiral Reserve Aircraft keeps a number of aircraft of each type at 48 hours' notice. In addition, all the reserves are brought forward at regular intervals and are checked and test-flown, so ensuring that they are maintained in first-class condition, and that their modification state is brought up-to-date.

Of the two Aircraft Repair Yards in this country, that at Fleetlands is the larger and more modern and, under the superintendence of a Captain (E), it is staffed by naval and civilian officers, but is manned entirely by civilian personnel (*circa* 1,400) who are, of course, directly employed by the Admiralty. The basic repair task at Fleetlands amounts to the complete overhaul of about 150 aircraft, 360 engines and 240 power-plants per year; in addition to this, a great deal of investigation and manufacturing work is done.



"Flight" photograph

The nerve centre of the Fleetlands repair yard is the Progress and Planning Section. The number of job-cards held is about 27,000.

Some few months ago, a scheme known as Standard Planned Repair was instituted in order to provide a standard procedure for the complete breakdown of the aircraft into interchangeable groups, the incorporation of modifications at suitable stages, and re-assembly for flight-test. The complete dismantling of the aircraft into basic interchangeable groups, each of which is surveyed and re-fitted to schedule, ensures thorough and complete repair treatment without loss of time. The groups, e.g., centre-section, fuselage, mainplanes and undercarriage, being interchangeable, could if necessary be exchanged between aircraft: in practice, however (excluding the centre-section), this is rather the exception than the rule. In the reconstruction of an aircraft, a reconditioned power-plant is fitted in every instance. By this means, the airframe and engine are brought into line and start a new lease of life together. Having gone through their individual reconstruction processes, the basic groups come together in the erection shop, from which the finished aircraft emerges for ground-test, armament test, painting and, finally, flight-test. Both test pilots are engineers, and accommodation for the test flight is given at Gosport, from where the test-flights are made.

Any account of naval aviation would be incomplete without some reference to the R.N.V.R. (Air) squadrons, the object of which is to maintain a strong and efficient reserve of officers and men who are fully trained in naval aviation duties. Each of these squadrons is based at an R.N.A. station, and although each has an R.N. flying

"Flight" photograph

This view of just one shop at Fleetlands gives some small idea of the immense task the Yard undertakes. Note Korean "stripes" in foreground.

instructor, an R.N. air engineer officer, and a staff of R.N. aircraft maintenance ratings, command of the squadron is vested in a Lt.-Cdr. (A), R.N.V.R., and the majority of the pilots are Lts. (A), all of whom served as pilots during the war. Soon, these numbers will be increased by the arrival of younger officers, who have been taught to fly during their period of National Service, and who join the permanent R.N.V.R. when they complete their training. In addition to aircrew, other R.N.V.R. officers in the squadrons include air traffic control officers, air engineer officers, electrical officers, supply officers and medical officers.

The majority of R.N.V.R. ratings attached to the squadrons are ex-Service aircraft maintenance ratings, many of whom, like the pilots, served with distinction during the war. These ratings enrol in the R.N.V.R. in the same rates that they held at the time of their demobilisation, and on joining are given a short refresher course in their former trade. As soon as it is considered that the volunteer rating has satisfactorily completed his refresher training, he is given an examination and, if successful, is re-awarded the "qualified to sign Form 700" qualification, whereupon he is employed on the servicing of aircraft in conjunction with R.N. ratings. In addition to aircraft maintenance ratings, other R.N.V.R. trades are: aircraft handlers; air traffic control ratings; stores assistants; sick-berth attendants; and photographers.

A separate activity of the R.N.V.R. squadrons is the week-end training of young men prior to their call-up for National Service. These pre-N.S. entrants are normally enrolled between the ages of 17 and 17½ years and, on entering as junior naval airmen, they are given one year's theoretical and practical training by the squadron, at the end of which, if they have completed the course satisfactorily, and are medically fit, they are called-up into the Navy. Suitable entrants are recommended for aircrew training.

Apart from their week-end training, all R.N.V.R. naval aviation personnel have to serve an annual period of 14 days' continuous training, and this is usually carried out at sea in an aircraft carrier. The carrier having proceeded to sea, the squadron aircraft, manned by R.N.V.R. aircrew, fly on board. During the first few days, deck landing practice is carried out and then, for the remainder of the period, the aircraft take part in various exercises. This period of embarked training is particularly valuable to the younger ratings, some of whom have never been to sea before; they learn a great deal during their fortnight afloat.

All R.N.V.R. personnel undertake to serve for a period of five years in the first instance. At the end of that time, there is an option to undertake a further five years' service. Officers and ratings can attend the squadrons at times other than week-ends if they so wish, and all are encouraged to take part in the social and athletic life of the parent station.

R.N.V.R. ratings and Seafires here seen in summer sunshine aboard "Illustrious" during their annual 14 days' embarkation.

BRITISH NAVAL FLYING

an outline history by

H. F. KING, M.B.E.

WHATEVER the true beginning of British Naval flying, the first event worth recording in the sketch now contemplated was an unpropitiously negative one—namely, the Admiralty's refusal to buy the proffered patents of the Wright brothers. This, it must be allowed, was in the year 1907, when only the Wrights themselves and the Brazilian Santos Dumont had accomplished sustained flight in heavier-than-air machines. The diffidence of the Lords of Admiralty in committing public funds is therefore understandable. There was, in any case, a well-reasoned inclination at this time towards the airship, for the exploits of the German Zeppelins were not passing unnoticed.

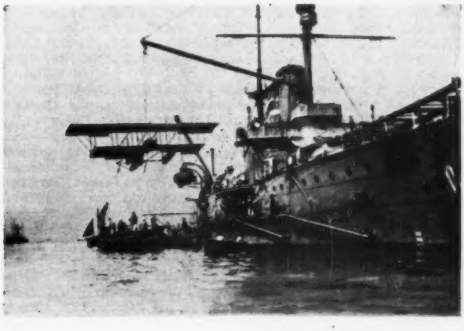
In July, 1908, the Director of Naval Ordnance proposed to the First Sea Lord that a Naval Air Assistant be appointed; that the Superintendent of Ballooning be placed in close touch with the Admiralty; and that a rigid airship, in the design of which Vickers Sons and Maxim, Ltd., should be consulted, be laid down for Naval use. In due time construction of No. 1 Rigid Naval Airship (dubbed *Mayfly*) was put in hand. To watch over her progress a special Admiralty branch was formed, with Capt. Murray Sueter, R.N. (later Rear Admiral), as Inspecting Captain of Aircraft and Cdr. Oliver Schwann (later A.V-M. Swann) as Assistant Inspecting Captain. From the work of both these officers in subsequent appointments British Naval aviation was to benefit greatly.

On the Advisory Committee for Aeronautics, set up by the Government in 1909 to co-ordinate aeronautical effort in many fields, the Royal Navy was represented by Capt. R. H. S. Bacon, D.S.O. Admiralty interest in foreign technique caused a commission to be sent to France in 1910, with the dual object of studying French equipment and of attending the first International Conference on Aerial Law.

A milestone in February, 1911, was the Admiralty's acceptance of Mr. Francis McClean's offer to lend two of his private machines, free of charge, for the instruction of Naval officers. This same gentleman (now Lt.-Col. Sir Francis McClean) had leased his airfield at Eastchurch to the Royal Aero Club for a rental of a shilling per annum, and here the sailors were to be taught. Mr. C. B. Cockburn became honorary instructor to the four officers who eventually took the six weeks' course, and, for a fee of £20, payable to Short Brothers, Mr. Horace Short gave technical instruction.

In *The Story of a North Sea Air Station*, Mr. Snowden Gamble quotes this extract from a letter, from Short Brothers to the Admiralty, concerning the arrangements: "We propose that they (the selected officers) should run round the ground without attempting to rise for one or two practices, and then do a few straight-line flights. They could then practise turning in a radius of about 440 yards. No practice will take place for the first week or two in winds of over 4 m.p.h. velocity." The Admiralty also made a stipulation—that no flying was to be done on Sundays.

Short biplane, with flotation bags attached to the undercarriage, being hoisted aboard H.M.S. "Hibernia" in 1912.



Wooden walls and whirling rotors—a Westland-Sikorsky Dragonfly demonstrates air/sea rescue in the very shadow of H.M.S. "Victory."

The first two officers to qualify were Lts. Samson and Longmore, R.N. It may be wondered how many of today's budding generation of Naval pilots, snug in their 450-m.p.h. Hawker Sea Fury trainers, or 600-m.p.h. Meteor 7's, are aware that these officers were perched on a framework behind Cockburn with no controls whatever, but with a hand lightly resting upon the instructor's and with an eye on the rudder bar. Of the three original instructional machines (Shorts Nos. 26, 28 and 34) the two last-named were acquired by the Admiralty in October, 1911. Other purchases followed. The soubriquets conferred on some of these early Naval trainers must be recorded. There was *The Dud*; the *Vacuum Cleaner* (the draught in the cockpit was alleged to pull the hairs out of a fur coat); *Field Kitchen*; *Triple Twin* (Short No. 39—the first twin-engined machine to fly in England); *Triple Tractor*, and *Double Dirty*. Seemingly the matelots were resolved to depart from traditional Naval nomenclature; even so, their craft resembled the good ship *Henri Grâce-à-Dieu* under full sail rather than a Naval trainer of to-day.

Late in 1911 Samson persuaded the Admiralty to draft twelve Naval ratings to Eastchurch as the nucleus of a Naval Flying School. The experiments of this little band were directed to adapting the aeroplane to Naval work, and Lt. Longmore and Mr. Oswald Short designed and tested flotation bags, by the aid of which Longmore successfully alighted on the Medway. As Air Chief Marshal Sir Arthur Longmore he recalls in his memoirs that, having wiped the spray off the engine, he flew the machine from the beach of the Isle of Grain and so back home to Eastchurch.

Lt. Samson obtained leave to build, in Chatham Dockyard, a double trackway suitable for launching aircraft from the decks of ships, and during December, 1911, in the Short S.38 pusher, he made a successful flight from such a platform on board H.M.S. *Africa*, riding at anchor at Sheerness. In addition to its wheels the Short had a pair of air bags which enabled it to alight on, but not to ascend from, the water. During May, 1912, the experiment was repeated from H.M.S. *Hibernia*, steaming at 15 knots.

The first ascent by a British seaplane was made at Barrow-in-Furness on November 18th, 1911, by Cdr. Schwann in an Avro biplane, with 35 h.p. Green engine. The floats were designed by Cdr. Schwann and built by Naval personnel. Mr. S. V. Sippe, an

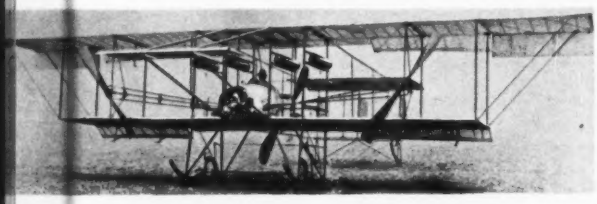
BRITISH NAVAL FLYING . . .

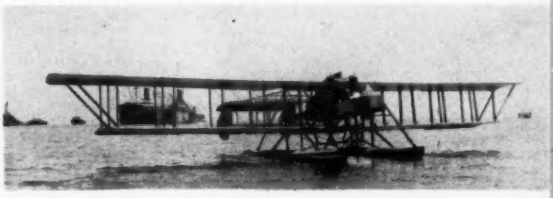
Avro pilot of the day, and still a familiar figure in the aircraft industry, participated in the experiments.

Experience with heavier-than-air landplanes and seaplanes, was steadily accruing, but the lighter-than-air side suffered a disastrous blow when the *Mayfly* dirigible broke her back during September, 1911. Having ridden out wind-gusts of over 40 m.p.h. while moored to a pontoon at Barrow-in-Furness, she had been returned to her shed for modifications. On being transferred once more to her moorings the catastrophe occurred. She was reduced to a total wreck. Structural weakness was established by a Court of Inquiry, and Naval Development of rigid airships was therefore abandoned.

During 1912 small-scale experiments were undertaken to determine the potentialities of Naval aircraft for bombing, mine-spotting and anti-submarine work. May of that year saw the formation of the Royal Flying Corps, comprising a Naval Wing with headquarters at Eastchurch, and a Military Wing, centred at Farnborough. In the same month the Central Flying School was established at Upavon, on Salisbury Plain, with a Naval officer—Capt. Godfrey Paine—as Commandant. Capt. Murray Sueter became Director of the Admiralty Air Department, and Cdr. Samson was given command of the Naval Flying School at Eastchurch. As might be supposed, the description "R.F.C.—Naval Wing" was short-lived, and the title Royal Naval Air Service came into general use, though it was not officially recognized until the R.N.A.S. was established in July, 1914.

In May, 1912, the Fleet was reviewed at Weymouth, and some early types of Naval aircraft were demonstrated. There was a pusher Short, with a 70 h.p. Gnôme engine and equipped with flotation bags, flown by Cdr. Samson from the forecastle of H.M.S. *Hibernia*; a Short "hydro-aeroplane", equipped with a wireless transmitter-receiver having a range of 3-5 miles; and Nieuport and Deperdussin landplanes.





A report by Capt. Sueter and Mr. Mervyn O'Gorman (Superintendent of the Royal Aircraft Factory, Farnborough), after their visit to France, Austria and Germany during 1912, gave a decided fillip to Naval flying. Interest in airships revived, and the Admiralty announced during October that a chain of Naval air stations would gradually be established along the coasts of the United Kingdom. The first to be commissioned (December, 1912) was on the Isle of Grain; during the first half of 1913 others were set up at Calshot, Felixstowe, Yarmouth and Cromarty. At this time the Naval Wing possessed 13 landplanes (eight biplanes and five monoplanes), three seaplanes and Naval Airship No. 2—a small, non-rigid Willows. In the Army Manoeuvres during September, 1912, Naval aircraft distinguished themselves in the reconnaissance role.

The pace of development quickened during 1913. Air Chief Marshal Longmore writes: "Just as in 1912 air reconnaissance had been sold to the Army as a result of the manoeuvres, I have always regarded 1913 as the year when the Navy began to be interested." As a Naval officer in 1913 he was appointed to H.M.S. *Hermes* (headquarters of the Naval Wing) to command Cromarty Air Station. Here Mr. Churchill was a constant visitor. "He had already been flown," Sir Arthur recalls, "by Lt. Spencer Grey at Calshot Air Station, and it was not long before I had taken him up in the Borel and Maurice Farman. . . . Winston was anxious to know what we young enthusiasts thought about the development of flying as it would affect Naval warfare."

The first occasion on which British Naval aircraft operated with the Fleet at sea was during the manoeuvres in July, 1913. Weather was poor, the seas often heavy, and the smaller machines took punishment; but Short seaplane No. 81, flown by Cdr. Samson, made a good impression. She was fitted with a 160 h.p. Gnôme engine, carried wireless, and had folding wings. Other types engaged were of Sopwith, Maurice Farman and Borel design. A number of submarine sightings were reported by aircraft.

As previously intimated, bombing from Naval aircraft had already been studied by this time (Cdr. Samson had dropped a dummy 100-pounder in 1912), and in December, 1913, experiments were put in hand to determine the lowest height at which bombs could safely be released. As no suitable missiles were available, floating charges were fired electrically from a destroyer while Farman seaplanes flew above. It is recorded in the official history *The War in the Air* that during 1913 training was carried on regularly at the C.F.S., at Eastchurch, and—for airship work—at Farnborough. By the year's end there were about 100 trained pilots. Wireless transmitting sets were in course of being fitted to all seaplanes, while a system for transmitting meteorological charts from the Admiralty, so that Air Stations and aircraft might receive statements of weather conditions, was working.

On January 1st, 1914, all British airships were transferred to the R.N.A.S. and Capt. E. M. Maitland, with most of his airship personnel, went over with them. Thus, the R.N.A.S. became possessors of six or seven airships of various patterns, including the Parseval, Astra Torres, and the British-built Beta. The first Naval Airship Station was at Kingsnorth.

Conflicting accounts have been published of the first torpedo-drop from a British Naval aircraft, but we have the personal assurance of Air Chief Marshal Sir Arthur Longmore that the facts are as related in his book *From Sea to Sky*. On the occasion of a visit to Calshot the First Lord of the Admiralty requested that torpedo experiments should be speeded up. "I told him," Sir Arthur writes, "that if I could retain a certain Short 160 Gnôme seaplane I would undertake within a short time to carry and successfully release a 14 in torpedo which weighed some 900 lb. The retention of the Short was agreed, and on July 28th (1914) I succeeded in getting this machine off the water with the torpedo slung below, and in launching it for its run."

Sir Arthur considers it probable that confusion has arisen in some accounts by reason of the fact that there was at Calshot at the time a Sopwith Canton-Unné "taxi-plane" (centre-section only), which was used for developing the release mechanism and for registering the behaviour of the float-undercarriage and structure under taxying conditions, with the torpedo in place. Lt. Robin Ross frequently handled this taxi-plane, and Lt. Hyde-Thomson was specially appointed to Calshot to take part in the development of torpedo aircraft. "These tests", Sir Arthur informs us, "took place from about March to July, when I saw the opportunity of doing what I have described in my book." Shortly afterwards (and this, apparently, has added to the confusion), a Sopwith Canton-Unné floatplane fitted for carrying the 900 lb, 14 in torpedo (the same as Sir Arthur had previously dropped) was delivered to Calshot. With this machine Sir Arthur and other pilots frequently flew with the torpedo and made quite a few successful practice runs at a target.

Also at Calshot was a Sopwith pusher seaplane with a 1½ pounder gun weighing 265 lb, mounted in the nose of the nacelle. With this Lt. Clark Hall, the gunnery officer, carried out many successful firing trials from the air. Meanwhile, transmission ranges of 6-8 miles were obtained with wireless telegraphy, and day searchlight-signalling was developed. German signalling equipment was proving satisfactory until the German agent concerned came down and hurriedly reclaimed it in July, 1914. Lt. Travers obtained good results with a Sopwith Bat Boat fitted with a headlight for night flying.

For the first time in the history of the British Navy a special place was reserved for seaplanes in the anchorage arrangements at the Spithead Review in July, 1914. The account in *Flight* reads: "The machines which took part in the 'fly past' were three of the big 160 h.p. Gnôme-Short machines, which have wings capable of being folded back when at rest, four of the 100 h.p. Gnôme-Short Tractors, four of the 100 h.p. Gnôme-Henry Farmans, three 100 h.p. Maurice Farmans, the Sopwith Tractor, with its 100 h.p. Green engine, and the Sopwith Bat-boat, which has a 90 h.p. Austro-Daimler motor. After this there was a demonstration by three of the land machines from Eastchurch, an 80 h.p. Sopwith and a couple of B.E.s. They came up in the form of a vee, and then Cdr. Samson, on one of the B.E.s, made some spiral flights which were closely watched by His Majesty."

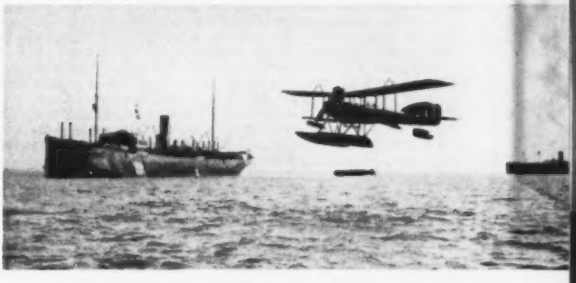
On the outbreak of war a system of coastal air patrol had already

been organized. The stations concerned were manned by 130 officers and about 700 men; there were 77 aircraft, including 31 seaplanes and 7 airships. Of 83 engines installed, only four were British. Three machine guns were available : one aircraft mounted a Maxim, another a Lewis (on loan to the Admiralty), and the Astra Torres airship had a Hotchkiss. A few machines carried rifles. The armoury at the Isle of Grain contained four hand grenades; Hendon and Felixstowe had twelve each, but Eastchurch boasted the impressive arsenal of 150 hand grenades, 42 rifle grenades, and 26 20-lb bombs ! A number of 6in shells were fitted with tail vanes for use as bombs.

Henceforth the R.N.A.S. developed at such a rate that our narrative must now become more general. An R.N.A.S. squadron from Eastchurch went over to Ostend to support the Marine Brigade and deny to the Zeppelins the use of territory within 100 miles of Dunkirk. Though there was little flying, the exploits of Samson and his R.N.A.S. armoured cars matched in audacity the historic and completely successful raid by F/L. Marix on the Dusseldorf Zeppelin shed. Marix's aircraft was an Avro 504; the date, October 8th, 1914. When the R.N.A.S. was obliged to retreat beyond Ypres it co-operated with the R.A.F. in trying to stop the German drive to the Channel ports. A seaplane base was established at Dunkirk and late in the year, from a point near the French frontier, Avros under Sqn.Cdr. Briggs damaged Zeppelins at Friedrichshafen and destroyed the gasworks. A seaplane raid on Cuxhaven and Wilhelmshaven was a gallant failure. In 1914, H.M.S. *Hermes*—our first, and at that time our only, seaplane carrier—was sunk.

With airships and seaplanes the R.N.A.S. kept up their wearisome and dangerous patrols during 1915. Offensive operations were generally insignificant, but there were exceptions, notably the actions against the Belgium-based Zeppelins. Within a few days of the first bombing of London, two of these monsters had been destroyed and a third damaged. The names of Warneford, Spencer Grey, Bigsworth, Wilson and Mills will always be associated with these exploits.

On the extreme left is the Short "Triple Twin" of 1911-12. This was the first British twin-engined aircraft to fly. The amazing floating structure in the next picture is a Wight seaplane, photographed at Mudros in the First World War; then comes a Short S.41 of 1912, with Winston Spencer Churchill in the cockpit. Heading this column is the Short from which Air Chief Marshal Sir Arthur Longmore made the first torpedo drop in this country, followed by Cdr. Swann's Avro—the first British aircraft to ascend from water ("Flight" photograph), and, last, a Short seaplane (Sunbeam engine) releasing a practice torpedo.



The seaplane carriers proved technical disappointments. Submarines were attacked from the air, but none was sunk. During 1915 the S.S. "sea scout" airship (sometimes—and not wholly erroneously—described as a gasbag with a B.E.2c fuselage slung underneath) went into service in quantity; the first was built in less than a month and the type was followed by the C "coastal" type, of longer range. The seaplane carriers *Ark Royal* and *Ben-my-Chree*, and the kite-balloon ship *Manica*, saw service in the Dardanelles.

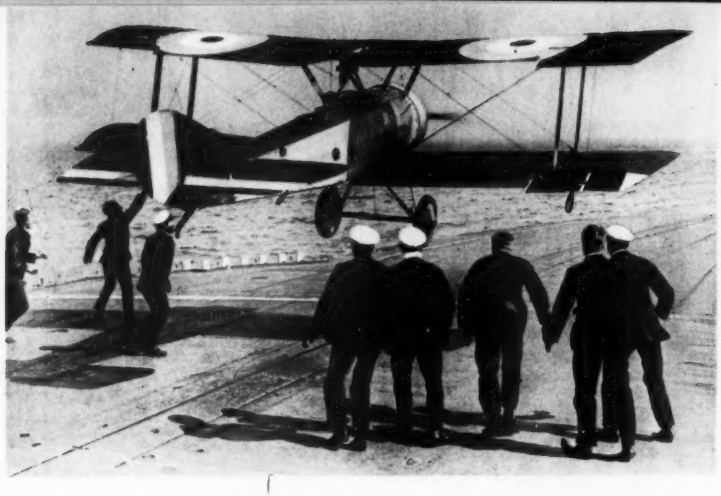
In that same theatre, on August 17th, 1915, protagonists of torpedo aircraft were resoundingly vindicated. Early on that day, two 225 h.p. Sunbeam-engined Short 184 seaplanes, each carrying a 14in torpedo and petrol for 45 min flying, left the *Ben-my-Chree* to attack Turkish merchantmen. The pilots were Flt.Cdrs. Edmonds and Dacre. Aiming at the centre ship of three, Edmonds released his torpedo. It ran true and struck home. Dacre was forced to alight on the water with engine trouble, but, sighting a steam tug, he taxied in its direction, slipped the "fish", and scored a direct hit. In celebration of the double victory, the refractory Sunbeam came to life again and Dacre flew back in safety to the mother ship.

In East Africa the cruiser *Konigsberg* was destroyed by gunfire from monitors, ranged by Naval aircraft, but such successes were infrequent. Many and bitter were the disappointments. In the early months of 1916 some gallant but inconsequential sorties were made against the German coast : of eleven seaplanes detailed for one raid, eight failed to get off the water; one hit a destroyer's aerial and sank, and one returned with engine trouble. To complete this chapter of accidents, the only machine to reach the target failed to hit it.

The Battle of Jutland, in May, 1916, was the occasion of the first air co-operation in a major Naval action : the little carrier *Engadine* operated one Short seaplane. The larger *Campania*, under the command of Capt. Swann, did not receive her signal to sail with the Fleet, and when at length she put to sea, she was so menaced by U-boats that Admiral Jellicoe ordered her back to port. Whatever the rights and wrongs of this deplorable affair, it was obvious that Fleet co-operation had not yet developed. A note on the *Campania* in an official publication is succinct and truthful : "Her for'ard funnel was replaced by two, set on either side of the ship to make room for a runway built right down to the bows. Her seaplanes, mounted on light trolleys, flew down this runway and dropped the trolleys as they took the air. They still had to land in the sea, however. Sometimes they were recovered intact."

By this time some fine aircraft were being delivered to the R.N.A.S.—Sopwiths, Shorts and American Curtisses among them. For his development of the famous "F" (Felixstowe) boats from the Curtiss "Americas", the name of W/C. J. C. Porte will always be remembered. In the armament field, likewise, the R.N.A.S. forged ahead; one of its warrant officers—F. W. Scarff—invented the gun ring which was to remain standard in the R.A.F. and Fleet Air Arm until the 1930s.

At the beginning of 1917 the R.N.A.S. had 1,501 aircraft—1,086 landplanes and 415 seaplanes—of 76 different types ! Not surprisingly, there ensued an effort towards standardization, which was to tell in later years. But in 1917 confusion and purposeless drifting were still rife in the growing Service.



An official photograph of great historical and technical significance, showing Sqdn. Cdr. Dunning landing—with manual assistance—a Sopwith Pup on the forward deck of H.M.S. "Furious" in 1917. On a second attempt this officer met his death.

BRITISH NAVAL FLYING . . .

Admiral Beatty, then commanding the Grand Fleet, said that, if a policy had been decided on, he would like one of the Naval Staff to visit him and explain it.

The year 1917 saw important developments in deck flying and in anti-submarine and anti-Zeppelin operation. The last of Lord Fisher's "hush-hush" cruisers, H.M.S. *Furious*, was fitted with a 228ft deck forward, in place of the monstrous 18in gun formerly emplaced there, and was commissioned for the R.N.A.S. Flying-off was relatively simple, but the forward position of the deck rendered it imperative for an aircraft to be "skidded" aboard. Sqdn.Cdr. Dunning made one landing-on in a Sopwith Pup, which was manually hauled out of the air-by the deck crew. He was killed in a second attempt. Subsequently, a landing deck with primitive arrester-gear was provided aft. Many of the larger ships were fitted with a flying-off platform built on to a gun turret, which could, of course, be rotated to suit wind conditions.

On August 21st, 1917, in an hour's flight in a Sopwith Pup from a flying-off platform on the cruiser *Yarmouth*, Flt.Sub.Lt. Smart shot down Zeppelin L.23 in flames. The big flying-boats, too, were scoring successes against the enemy airships and submarines; but in general the striking power of the Service was still puny and dissipated. A whole flotilla of German destroyers, frozen-in at Bruges, was attacked for a week—with less than four tons of bombs, not one of which scored a hit.

In Flanders the offensive was aided by Handley Page 0/400 and D.H.4 bombers of the R.N.A.S. The Handley Page had been ordered as early as 1914 by Commodore Murray Sueter, who thereby earned for himself the title "The biggest damned fool in the Navy". In this one instance, at least, operational requirements were stated with admirable lucidity, for Mr. Frederick Handley Page was requested to build "a bloody paralyzer". Such terms of reference were perfectly understood by "H.P."

In the Mediterranean and Adriatic some useful but small-scale operations went ahead, and good work was done in support of the British advance in Palestine by R.N.A.S. aircraft. More by luck that judgment, the cruiser *Breslau* was sunk in January, 1918—zigzagging to avoid R.N.A.S. bombs, she nosed into a minefield. But when the *Goeben* was driven aground, bombing proved ineffective, and there were no torpedo aircraft to despatch her.

On April 1st, 1918, the Royal Air Force came into being, and the personnel of the R.F.C. and R.N.A.S. were transferred, with their own consent, to the new force. By slow degrees the Service was obliged to discard its beloved Navy blue and take to khaki. Its material contribution was some 500 officers, 50,000 other ranks, and more than 2,800 aircraft.

As the climax of the war developed, so the U-boat campaign increased in severity. To supplement the available landplanes, floatplanes, flying-boats and airships nearly, 200 D.H.6 "Clutching Hand" trainers, were pressed into service. (There was to be a striking analogy in 1940, when D.H. Tiger Moths were hastily armed and stood by to repel invaders).

Sometimes described as the first "proper" aircraft carrier (by virtue of having a flush deck), H.M.S. *Argus* was ready for service in 1918. She was converted from the Italian liner *Conte Rosso* and was descriptively dubbed "The Flatiron".

On July 8th, 1918, the great Zeppelin base at Tondern was attacked by Sopwith Camels, flying from the aircraft carrier *Furious*: L.55 and L.60 were destroyed. On August 11th, L.53 met the same fate off Terschelling. Again, the victor (Lt. S. D. Culley) flew a Camel, which he took off from a towed lighter. Through his glasses Rear-Admiral Tyrwhitt watched the action and, as the Zeppelin fell in flames, instructed his Flag Lieutenant to make this signal: "Flag—general: your attention is called to Hymn No. 224, verse 7". Feverish reference to *Hymns Ancient and Modern* disclosed:

O happy band of pilgrims,
Look upwards to the skies,
Where such a light affliction
Shall win so great a prize.

Until the end the arduous patrols went on, bombs were sprinkled on enemy bases, seaplane fought seaplane. Deficiencies in co-operation and equipment there may have been in the four grim years, but never in valour or personal initiative.

And so one great post-war run-down began. In July, 1919, Naval Rigid Airship R.34 made the double Atlantic crossing, and in December all air units working with the Navy, including airships, were placed under the control of R.A.F. Coastal Area. The Admiralty, however, sought from that time forward to redress this state of affairs, and to recover control of the Fleet Air Arm (created April, 1924). Certainly the situation was anomalous, for whereas the Air Ministry was responsible for training and maintenance, the Fleet Air Arm operated, when at sea, from the carriers of the Royal Navy. Since 1921 Naval observers and telegraphist air-gunners had displaced R.A.F. personnel from the rear cockpits of Naval aircraft, and eventually a compromise was effected whereby upwards of 70 per cent of F.A.A. officers should be Naval officers. But though co-operation between the two Services was exemplary under this "dual-control" system, the Navy's goal was not in sight until July 30th, 1937, when the decision was taken to vest complete control of the Fleet Air Arm in the Admiralty. Not until May, 1939, however, did the F.A.A. truly become part of the Navy.

During these years of conflict in high places the new carriers *Eagle*, *Hermes*, *Furious*, *Courageous* and *Glorious* were commissioned. There was great reluctance to adopt monoplanes in succession to proven types of deck-landing biplanes. A number of warships were fitted with catapults for the launching of floatplanes or amphibian flying-boats, and in 1938 the magnificent carrier *Ark Royal* was commissioned. She had two accelerators forward and carried 60 aircraft in three hangars. Her name was to become world-famous.

On the outbreak of war the principal Royal Naval Air Stations were Lee-on-Solent (H.M.S. *Daedalus*), Donibristle (H.M.S. *Merlin*), Worthy Down (H.M.S. *Kestrel*), and Ford (H.M.S. *Peregrine*). Types of aircraft in service were the Fairey Swordfish and Blackburn Shark (torpedo-spotter-reconnaissance three-seaters); Gloster Sea Gladiator and Hawker Nimrod (single-seat fighters); Blackburn Skua (fighter/dive-bomber); Supermarine Walrus (spotter-reconnaissance amphibian, affectionately known as the "Shagbat"); and Fairey Sea Fox (light reconnaissance seaplane). Some 200 machines were disposed aboard carriers and about 50 in other ships. Five carriers were in commission, three were engaged on trials or training, and six were building.

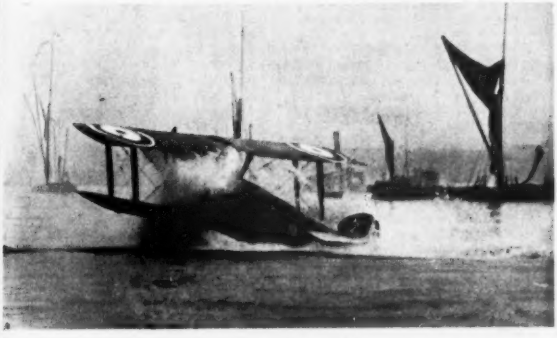
To attempt to relate in a couple of thousand words the deeds and development of British Naval aviation during the late war is to lay oneself open to manifold charges of omission. At best this account can record a few events, a few typical acts of courage and achievement, and, it may be hoped, whet the readers' appetite for further reading.

On September 19, 1939, H.M.S. *Courageous* was torpedoed and sunk, and a week later the first enemy aircraft to be destroyed during the war—a Do 18 flying boat—fell to the guns of a Blackburn Skua from *Ark Royal*. The carrier was attacked by German bombers, one of which scored a near miss. This the enemy

assessed as a death-blow, and henceforth Lord Haw-haw was to repeat *ad nauseam* his question "Where is the Ark Royal?"

Though since the war began Naval aircraft had rendered invaluable service in patrolling and convoying, the invasion of Norway afforded the first opportunity for intensive action. On April 12th, 1940, sixteen Blackburn Skuas, having taken off from Hatston, in the Orkneys, sank the German cruiser *Konigsberg*, in Bergen harbour. Together with Swordfish, Skuas were to play a valiant part in the subsequent actions in Norway. They fought, bombed and reconnoitred. Many were lost through enemy action or shortage of petrol. On the withdrawal from Narvik, a squadron of standard R.A.F. Hurricanes flew on to the deck of *Glorious*, but having set course for England the great carrier was intercepted by heavy German warships. She was set afire, and went down fighting.

Though the Battle of Britain is rightly acknowledged as an R.A.F. "show", some of the Spitfires and Hurricanes were manned by Naval pilots. Swordfish, Albacores and Skuas operated, under Coastal Command, against "invasion" barges and E-boats, and saw action over Dunkirk, where Swordfish accounted for two heavy



(Above) A Sopwith Camel aboard a lighter, with 30-ft flying-off platform, towed at 10 knots behind a destroyer. (Below) A fighter of the same type is seen at the instant of a deliberate "ditching."

batteries menacing our withdrawal. With an extra petrol tank in the rear cockpit, the "Stringbags" (for so the Swordfish had come to be known) flew numerous minelaying sorties. For six hours or more pilot and observer braved the weather in open cockpits.

In the Mediterranean, as a prelude to an offensive, it was necessary to undertake the melancholy task of denying the Germans use of the French warships. The Fleet Air Arm struck at ships at Oran, and at Dakar torpedo hits by Swordfish put the *Richelieu* out of the war.

There followed a series of engagements (or attempted engagements, for the Italians were not over-anxious for a trial of strength) in which Naval aviation was employed with fair success. At Bomba Bay, in August, a destroyer, a depot ship and two submarines were sunk by three torpedoes (the explosion in a submarine set fire to the destroyer), but the crowning achievement—Taranto—came on the night of November 11th, 1940. This date, it may be marked, was near enough a quarter of a century after the historic exploit of Edmonds and Dacre against the Turkish merchantmen.

In moonlight, a dozen Swordfish were ranged on the deck of *Illustrious*, steaming 170 miles S.E. by E. of Taranto, the great Naval base inside the heel of Italy. Six carried torpedoes, four had bombs, and two had flares and light bombs. On course for the target, cloud caused four machines to break formation.

The first flares went down and the flare-droppers made a diving attack with their light bombs. Then the five torpedo carriers swept in for the release. As the flares lit up the harbour the first sub-flight went in at 4,000ft, led by Lt.Cdr. Williamson. The second aircraft descended to 30ft and attacked a *Cavour* class battleship from 700 yards : an explosion followed. The remaining pilot attacked the same target. Those following selected two *Littorio* class battleships and one pilot saw a column of smoke rise abaft the funnels. By that time cruisers had opened fire and were hitting merchant ships. Three barrage balloons were set alight by flak. One pilot sang out to his observer, "Where's that bloody balloon barrage?" Came the patient explanation, "We've been through it once and we're just going through it again."

Capt. Oliver Patch, R.M., in one of the bombers, had difficulty in identifying his target, but dive-bombed two cruisers. Another bomber dropped a stick across four destroyers, and a third scored a direct hit on a seaplane hangar.

Meanwhile the second force of nine Swordfish, led by Lt.Cdr. Hale, began flying-off. Five were armed with torpedoes, two with bombs, and two with flares and bombs. One Swordfish (Lt. E. W. Clifford) had to be struck down for repairs. The observer, Lt. Going, while on patrol that morning, had "ditched" 20 miles from the carrier, but he obtained the Captain's leave to follow the striking force with Lt. Clifford; they took off 20 minutes after the others.

After the formation had been flying for 20 minutes one Swordfish had to return. The remainder sighted flares and flak while 60 miles from Taranto. Just before midnight the flare-droppers were detached and the torpedo aircraft attacked the battleships. One pilot had his aircraft knocked out of control by bullets hitting an aileron rod; he regained control, and as he came down to water-level he could see a battleship silhouetted against the flares and the moon. He dropped his torpedo on her port quarter and his port wing was hit as he made his getaway.

The cruisers, shore batteries and battleships opened fire. The battleships seemed to hit the cruisers, and the cruisers hit several merchant ships and set them ablaze. The Swordfish flew through a criss-cross of fire; the air stank with incendiary bullets. As one pilot released his torpedo his undercarriage touched the sea, sending up an enormous column of water behind; but he pulled out.

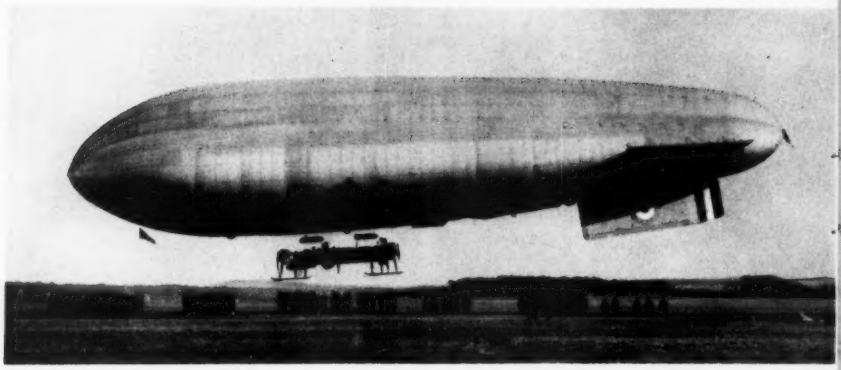
By the time Clifford's aircraft reached the scene the main attack had been over some 15 minutes. The harbour was lit up by burning ships, and the Italian gunners concentrated their fire on the lone Swordfish as it dived through the barrage to drop its bombs across the line of cruisers.

Two Swordfish failed to return, but a handful of "Stringbags" had changed the balance of Mediterranean sea power.

The year 1940 saw the introduction of catapult ships for convoy protection, originally with Naval, later with R.A.F., pilots. Deliberate parachute drops into the icy Atlantic were routine. The catapult ships were augmented during 1941 by escort carriers, the first of which was H.M.S. *Audacity*.

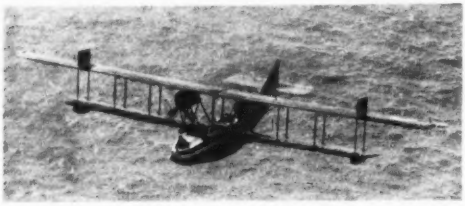
In that year German and Italian aircraft were mauling our convoys, as they made their way through "Bomb Alley",

A Sopwith 1½ Strutter leaves on a scouting flight from the flying-off platform built over the turreted guns of a British warship. Later, on battleships and cruisers, these platforms were superseded by catapults.



*Coastal airship C*1 on the landing ground at East Fortune. (Below) A heavily armed F.2A flying-boat patrolling over the North Sea.*

BRITISH NAVAL FLYING . . .



between Sicily and Libya. Fairey Fulmar eight-gun fighters did a fine job in destroying shadowing aircraft, and Swordfish and Albacores from Malta struck by night against the enemy's supply ships. The Navy was able to extend another helping hand to the R.A.F. by flying-off fighters for the reinforcement of Malta.

Just as Taranto was a classic illustration of deftly applied Naval air power, so the actions against the Italian fleet at Matapan, and in pursuit of the battleship *Bismark* in the Atlantic, will endure as object lessons in co-operation; for, although the torpedo aircraft failed to achieve any sinkings themselves, they inflicted such damage that heavy warships were delivered up to the Fleet for the *coup de grâce* by gunfire.

Having survived numerous air attacks, the *Ark Royal* was sent to the bottom by a German submarine on November 14th, 1941. Said the First Lord of the Admiralty: "In her short but active career she has paid the nation a rich dividend."

February, 1942, will be remembered as the month of the heroic but disastrous sortie by Swordfish, under Lt. Cdr. Esmonde, against the *Scharnhorst*, *Gneisenau* and *Prinz Eugen*, as they fled through the Channel. Only five men survived the slaughter and Esmonde was posthumously awarded the Victoria Cross. He was the first member of the Fleet Air Arm to receive it.

By 1942 the Battle of the Atlantic was in its grimmest stages, but escort carriers, with three or four Swordfish apiece, were playing a decisive part in co-operation with long-range, shore-based aircraft of R.A.F. Coastal Command, and new types of anti-submarine vessels, by that time in service with the Royal Navy. The Mediterranean sea lanes continued to be bitterly contested, but here again new equipment, including radar, was beginning to tell. Against one convoy in August, nearly 300 Axis aircraft did their worst; but while our ships were under fighter protection they came to little harm.

An elementary but successful pathfinder technique was developed by Fairey torpedo bombers operating with the R.A.F. in North Africa. The story of their exploits against land and sea targets reads like a boys' adventure book. Consider this gem, from Lt. Cdr. B. J. Hurren's *Swordfish Saga*:- A young lieutenant of a Swordfish squadron secured permission to make a one-man raid. He dispensed with every unwanted item, including the navigator and radio operator, and had the Swordfish decked out with 250 lb bombs and flares. For good measure he stowed away ten 20-pounders with screamer attachments. The "Stringbag" trundled off into the desert night. Normal maximum flight time was accepted as four hours. After 4¼ hour the ground crews began to get a little anxious; after 5 hour they were sure the Swordfish was down; after 5 hour 15 minutes it came home. Only, said the pilot, by hitting a hump in the ground had he become airborne at all. An R.A.F. Blenheim set out next day to check up. The "Stringbag's" wheelmarks extended over a measured distance of 11¼ miles. In detail the story may be apocryphal; but in essence it is typical of F.A.A. resourcefulness.

Two more carriers were lost in 1942—*Hermes*, off Ceylon, and *Eagle*, in the Mediterranean—but, in addition to escort carriers, the fleet carrier *Indomitable* (subject of the special pictorial feature in this issue) was commissioned during the year. Operations in Madagascar and North Africa showed how carrier-borne aircraft could cover amphibious assaults. In North Africa, particularly, the newly introduced Vickers-Supermarine Seafire fighters showed their mettle. Like the Hawker Sea Hurricane, the Seafire had been developed from a proven R.A.F. machine.

America supplied more escort carriers during 1943. Hundreds of Fleet Air Arm pilots were trained in the U.S.A. and some excellent American carrier-borne fighter and strike aircraft saw service on British carriers. In the Pacific, aircraft from the *Victorious* landed aboard a carrier of the U.S. Navy, while American machines paid a return visit. In the Atlantic the escort carriers, with their collaborators, went from strength to strength. One running fight lasted for several days, during which H.M.S. *Biter* was responsible, in co-operation with surface vessels, for attacking twelve U-boats. Two were destroyed, three others probably destroyed, and several damaged. When the heavily-armed U-boats began to remain surfaced to fight it out with attacking aircraft, the practice was instituted of pairing a Martlet fighter with each depth-charge-laden Swordfish, the Martlet being responsible for dealing with the U-boats' high-angle guns. One submarine surrendered to a Swordfish. "For the four months ending September 18th, 1943," reported Mr. Churchill, "not a single merchant vessel was sunk by enemy action in the North Atlantic."

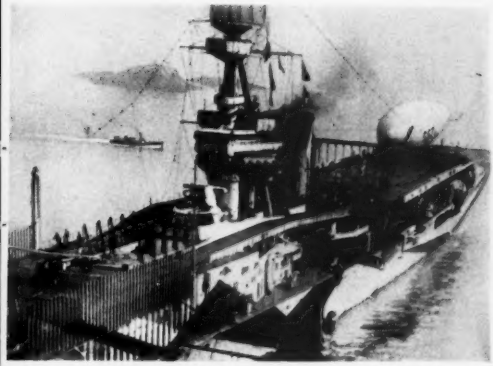
In the Channel, Fairey Albacores of the F.A.A. were the scourge of enemy shipping. In hundreds of sorties they struck with torpedoes and bombs or stealthily sowed their mines.

In September, 1943, Seafires covered the Salerno landing. Twenty-six of them flew ashore and made 74 patrol-sorties before the R.A.F. arrived to take over.

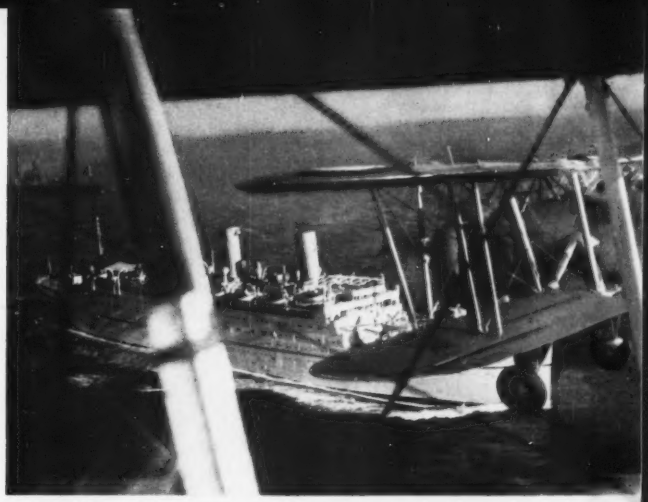
New types of aircraft, including the Fairey Barracuda and Firefly, came into the limelight during 1944. "Barras" were in action on April 3rd against the *Tirpitz*, and soon afterwards struck at installations in Northern Sumatra. Swordfish, Avengers and Wildcats safeguarded the Russia-bound convoys against attack by sea and air.

On the fateful D-Day, June 6th, 1944, the Fleet Air Arm was prominently on the scene, one wing alone flying over 400 sorties in the day. In the Far East, Corsairs and other Naval machines were spreading destruction on land and sea and in the sky, while in the Mediterranean, between August 15th and 23rd, the carriers *Emperor*, *Khedive*, *Searcher*, *Pursuer*, *Hunter*, *Attacker* and *Stalker* flew off an average of one aircraft every six minutes from dawn to dusk in support of the landings in Southern France.

Late 1944 and early 1945 was a period of heavy Naval/air assaults in the Far East, mounted from the fleet carriers *Illustrious*, *Formidable*, *Indomitable*, *Victorious* and *Indefatigable* against Japanese oil refineries. In later actions both *Indefatigable* and *Victorious* were hit by Japanese suicide aircraft, but survived. Then, at mid-summer, in company with aircraft of the U.S. Navy, British Naval air power struck at the Japanese mainland.



The non-rigid airship S.S.Z.59 is seen after landing aboard H.M.S. "Furious." Forward is one of the squadron of Sopwith 1½-Strutters based aboard this early aircraft carrier.



A happy memory of 1939 : Fairey Swordfish from H.M.S. "Ark Royal" dive in salute past the "Empress of Australia," bearing Their Majesties the King and Queen to Canada and the U.S.A. Design of the Swordfish altered but little during the war.

Destruction of enemy aircraft, shipping and shore installations mounted at a staggering rate, till at length—on August 14th, 1945—aircraft on course for Tokyo were instructed to jettison their bombs into the sea and return to their carriers. The war was over.

The material price paid by Naval aviation was eight carriers and some 2,000 aircraft; there remained 51 carriers and about 2,700 aircraft. Eighty-three air stations were in commission.

And so a second great run-down began. In September, 1946, the Admiralty announced that the term "Naval Aviation" would supersede "Fleet Air Arm"; but no change of title could annul any of the traditions established or the lessons learned in those tempestuous years during which the Service was growing up. For grown up it now is, and to-day the Royal Navy is well imbued with the principles of air warfare. Many senior officers have had carrier experience. As for *matériel*, the Hawker Sea Fury, de Havilland Sea Hornet and Short Sturgeon are excellent post-war types. All are piston-engined, however, and it must be admitted that at the moment there is little evidence of re-equipment with turbine-powered aircraft, apart from the presence of a few de Havilland Sea Vampires. Operational types currently in Service are the Sea Vampire, Sea Hornet 20 and 21, Sea Fury 11, Seafire 47, Firefly 4, 5 and 6, Firebrand 5, Barracuda 3, Supermarine Sea Otter, and Westland-Sikorsky Dragonfly helicopter. Trainers include the Oxford, Anson, Sea Mosquito, dual-control Firefly, Meteor T.7, and Sea Fury T.20. The Percival Sea Prince is used for training and communications, and the Short Sturgeon and de Havilland Mosquito serve as target tugs.

In November last year, Vice-Admiral M. J. Mansergh, the Fifth Sea Lord and Deputy Chief of Naval Staff (Air), outlined the main tasks which would fall to our carrier-borne aircraft, and referred to the new types on order. In order of importance the tasks were anti-submarine warfare; the air defence of the Fleet and convoys at sea; and strikes against land and sea-surface targets. For anti-submarine work the Navy's ideal was a machine capable of functioning in both the search and strike rôles—what the Americans call a "single-packet" design. Since the Fifth Sea Lord spoke, these requirements have been met by the Fairey 17, powered with an Armstrong Siddeley Double Mamba turboprop, and the type is now in quantity production.

Vice-Admiral Mansergh declared that two classes of fighter were needed—a two-seater, all-weather day-and-night machine for convoy and Fleet protection in instrument flying conditions, and a fair-weather Fleet-defence type of the highest performance. The first requirement would be met by a version of the de Havilland Venom (D.H. Ghost), the second by the Vickers-Supermarine Attacker (Rolls-Royce Nene), and—later—the Hawker Sea Hawk (Nene). For strike duties the Westland Wyvern (Armstrong Siddeley Python) would shortly come into service, and Vice-Admiral Mansergh stressed that it was very necessary to keep alive the technique of torpedo dropping.

Existing fleet carriers, he said, were being modified to take the aircraft of the future; their decks, lifts and arrester wires were being strengthened. Catapults and "more unorthodox" methods of take-off might become normal, and the Vice-Admiral admitted that the Navy was interested in vertical launching. Experiments with flexible decks, he disclosed, were continuing and gave "considerable promise." Preparatory to the large-scale introduction of jet aircraft, a programme of runway reconditioning at Royal Naval Air Stations was well under way. Vice-Admiral Mansergh promised that Naval Aviation was prepared to repeat the gallant and resounding action of Taranto.

The work of Naval Aviation to-day is described at some length in this issue, and that it is above all a *fighting* Service will be gathered from the foregoing narrative. This could not be concluded more appropriately than with a reference to the work of our Naval aircraft in Korea.

When he introduced the Navy Estimates this year, the Parliamentary and Financial Secretary to the Admiralty recalled that, when the Korean trouble started, the Far Eastern Fleet was a thousand miles away from its base on a summer cruise. Within three days it was on station, and within six days was engaged in operations. Within eight days sorties were being flown from the light fleet carrier H.M.S. *Triumph*. The broad division of responsibility, he said, had been that the British and Commonwealth Navies had looked after the west coast, while the United States Navy had operated off the east coast. The really outstanding feature of the Naval side of the operations had been the work of H.M.S. *Theseus*. Since the ship arrived off Korea the ship's company had worked in such a way that no aircraft was unserviceable for longer than two hours. The unprecedented figure of 1,300 deck landings had been made without a failure and without an accident. When an accident did at length happen, it was a minor one, due to a machine landing in very rough weather and buckling a strut. One incident was singled out for special mention. A pilot from *Theseus* was attacked, his aircraft was damaged and he made a forced landing behind the enemy lines. He was wounded and trapped. Immediately a United States helicopter flew out to the rescue. The crashed machine was found, and the pilot and doctor in the helicopter fought off enemy troops, who were approaching. They cut the British officer loose, extricated him, got him aboard the helicopter, and returned him to his ship.

Of the ship's company of H.M.S. *Theseus* the Parliamentary Secretary said, "They have been operating at a higher level of efficiency than ever known before."

By this time (it may be hoped) being aware of what Naval Aviation has "known before," the reader will agree that this is praise indeed.

Blackburn Skuas were the first deck-landing monoplanes in service.

Vickers-Supermarine Attacker (Rolls-Royce Nene turbojet).

BRITISH NAVAL AIRCRAFT

Past and Present Types for Fighting, Reconnaissance and Attack

IN these pages the aircraft which form the standard equipment of Naval Aviation today are illustrated and briefly described in company with certain of their ancestors and some of the newest prototypes.

That a few of the old-timers may raise a smile, especially among younger readers, is to be expected; but though the cut of their jibs may sometimes appear outlandish, it will be agreed that, as with all seafarers, they have a breezy individuality. Past enemies upon, beneath and above the sea, and on shores where our Naval squadrons have been sent by the exigencies of war, would hardly fail to agree.

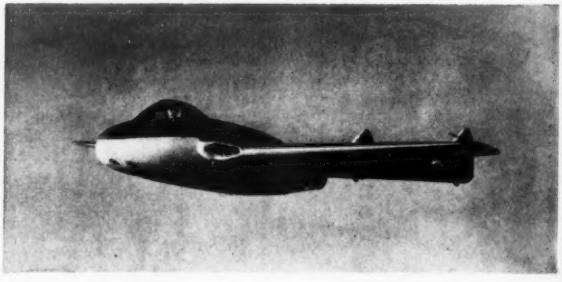
A fact which emerges from the following survey is that for well over a quarter of a century Naval-aircraft construction has been largely concentrated in the hands of certain famous manufacturing concerns. This is quite natural, for, notwithstanding the close relationships borne by certain deck-landing aircraft to land-based counterparts, the business of Naval-aircraft construction is a specialized one, in which experience has often proved the key to success. It is a reassuring thought that the Sea Hawk jet fighter, soon to enter service, can trace its ancestry back through a line of distinguished Naval fighters to the tiny Sopwith Tabloid, and that Fairey, Blackburn and Short machines in service today are directly descended from types supplied to the Royal Navy between thirty and forty years ago.

Quite early in Naval/air history the need was apparent for three main classes of aircraft, suitable for fighting, strike and general reconnaissance/anti-submarine duties. Under these heads, therefore, our review has been prepared, though, as will emerge in the narrative, multiple requirements have often been met by a single type.

Not included, for reasons of space, are the fine American machines supplied to the British Navy in both World Wars. Exemplary service was rendered by Grummans, Chance-Voughts, Curtisses and Beechs, and even today a few American machines remain on charge. Special mention must be made of the big flying-boats which fought and reconnoitred, to the enemy's intense discomfort, during World War I; though manned by Naval crews they have no counterparts in Naval Aviation today. The Short Sunderlands of the R.A.F., however, are still adding lustre to the tradition founded by those far-ranging, hard-fighting "F" boats. Airships used by the R.N.A.S. with notable success included the S.S. (sea scout, otherwise known as the Blimp); S.S. "P"; S.S. "Zero"; C. (Coastal); C. "Star"; and N.S. (North Sea) types.

Credit is due to the Royal Aircraft Establishment, Farnborough, for much of the equipment—e.g., catapults—associated with modern ship-flying.

The de Havilland Sea Vampire (below) is in service in small quantities. It is Britain's first Naval jet fighter, and has a Goblin turbojet.



The Nene-powered Hawker Sea Hawk single-seater (left) is in production, as is the two-seater de Havilland Venom (D.H. Ghost turbojet), a shore-based prototype of which is shown in the "Flight" photograph below.

"Flight" photograph

Last of the piston-engined Naval fighter/bombers is the highly versatile Hawker Sea Fury F.B.11, powered with a Bristol Centaurus engine.

Fighters

IN the First World War Naval fighters ranged from the willing little Sopwith Baby floatplanes and Pup, Triplane and Camel landplanes to the big flying-boats which, bristling with Lewis guns, swept far over the North Sea in search of trouble. Unique circumstances attended the use of the Sopwith Triplane by R.N.A.S. squadrons. Originally these had French Spads, but Spads were coveted by R.F.C. squadrons, themselves equipped with the "Tripes"; so a straight "swop" was arranged to the satisfaction of all concerned—except the German pilots, many of whom fell to the guns of the astonishingly manœuvrable and fast-climbing Triplanes of the R.N.A.S. Even when the Bentley-engined Camel became available the Naval pilots were dubious about giving up their beloved three-wingers. A little-known prototype Zeppelin-destroyer—the massive Supermarine Nighthawk—was a multi-seater, cannon-armed, *quadruplane!*; the same company (later responsible for the Seafire and Attacker) also developed some remarkable little single-seater flying-boats capable of performing all normal aerobatics. The Kitten biplanes, built at Grain and Eastchurch, were probably the smallest and lightest fighters ever built.

After the war the Gloster company turned out some interesting and efficient Naval machines, including the Mars IV (Sparrowhawk), with hydrovane undercarriage to facilitate "ditching," and, later, the Gambet for the Japanese Navy. Later still they built the Sea Gladiator; the immortal *Faith*, *Hope* and *Charity*, defenders of Malta, were of this type. Hawkers produced the Hoopoe and Nimrod and the two-seater Osprey; Faireys developed various marks of Flycatcher, the Firefly (biplane), and Fleetwing; Shorts the Gurnard; Blackburns the Nautilus; Parnalls the Plover and Pipit; Avros the Avocet; and Vickers, various types of bi-

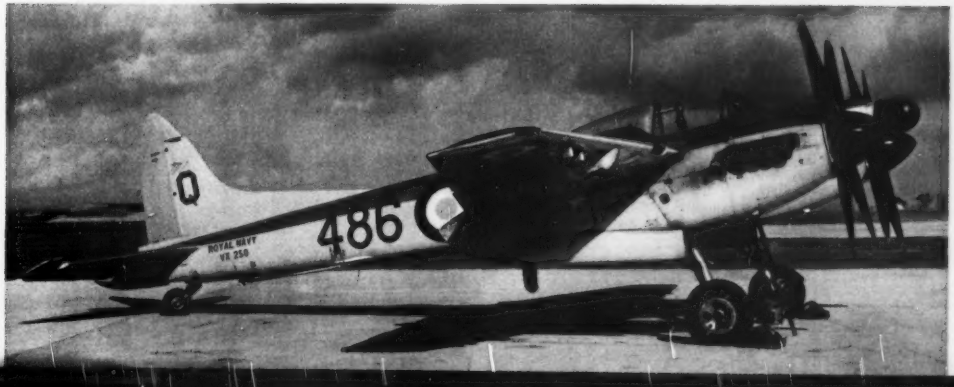
"Flight" photograph

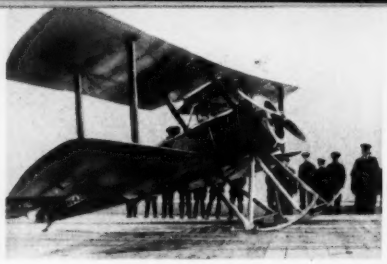
The Vickers-Supermarine Seafire (a Mk 46 is depicted above) remains in service with R.N.V.R. squadrons. The engine is a Rolls-Royce Griffon.

On the right is seen one of the first series of deck landings by a swept-wing jet fighter. The aircraft was the experimental Supermarine 510.

The two-seater radar-equipped de Havilland Sea Hornet N.F.21 (below) will be superseded by the jet-propelled Venom of the same make.

"Flight" photograph





FIGHTERS...

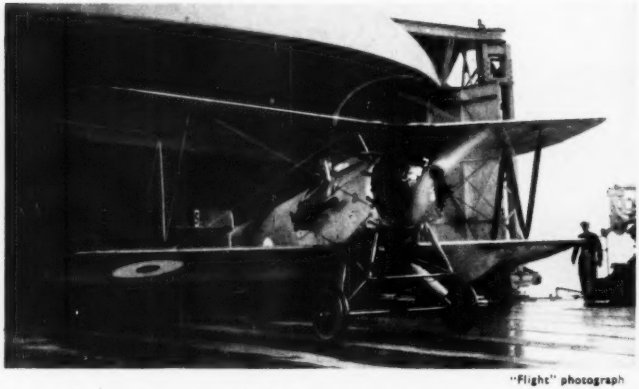
(Top left) Sopwith Baby seaplane fighter. (Above) Sopwith Pup with experimental skid undercarriage. (Upper right) Sopwith Camel (naval version with one Vickers and one Lewis gun). (Right) Hawker Nimrod.

"Flight" photograph

The Jaguar-engined Fairey Flycatcher on the left is seen taking off—straight out of its hangar—from the lower flight deck of H.M.S. Glorious.

plane and the interesting Vireo monoplane. Handley Page developed a remarkable little slotted and flapped monoplane, but this was delivered only to the U.S. Navy.

The first deck-landing monoplanes to go into service were the Blackburn Skua fighter-dive-bomber, the Blackburn Roc turret fighter, and the Fairey Fulmar, which had eight fixed guns. War-time necessity led to brilliant conversions of the Hawker Hurricane and Vickers-Supermarine Spitfire, the "navalized" versions being the Sea Hurricane and Seafire. Faireys produced the two-seater Firefly in various marks, originally for fighter/reconnaissance duties, though today



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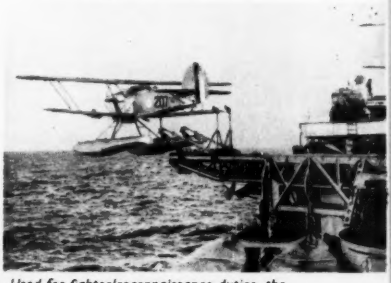


Used for fighter/reconnaissance duties, the Hawker Osprey (seen above leaving a cruiser's catapult) was a Kestrel-powered two-seater, with wheels or floats.

the type is generally employed (as in Korea) for strike duties or on anti-submarine operations. There follow brief details of representative Naval fighters now in use or on order :

de Havilland Sea Vampire 20.—Span, 38ft; power plant, de Havilland Goblin 2 turbojet; armament, four 20 mm guns; max. speed, 526 m.p.h. at S.L.; initial rate of climb, 4,300ft/min. (N.B. The Sea Vampire 21 is an experimental development for deck-landing without undercarriage, in conjunction with a special rubber deck.)

Vickers-Supermarine Attacker 1.—Now in production and shortly to be delivered to squadrons. Span, 36ft 11in; flying weight, 11,750 lb; power plant, Rolls-Royce Nene turbojet; armament, four 20 mm guns (plus two 1,000 lb bombs or R.P.s); max. speed, 583 m.p.h. at S.L.; climb to 30,000ft, 6.9 min.

Hawker Sea Hawk 1.—Now in production. First deliveries to be made later this year. Span, 39ft; power plant, Rolls-Royce Nene; armament, four 20 mm guns.

de Havilland Venom.—Details of the Naval deck-landing version of the Venom two-seater night fighter (de Havilland Ghost turbojet) are not yet released for publication.

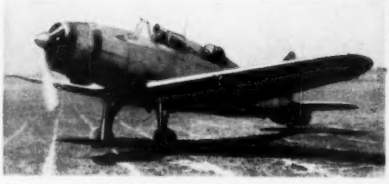
Hawker Sea Fury 11.—Span, 38ft 5in; flying weight, 12,350 lb; power plant, Bristol Centaurus sleeve-valve piston engine; armament, four 20 mm guns (provision made for various external loads, e.g., two 1,000 lb bombs or twelve 60 lb R.P.s); max. speed, 453 m.p.h. at 20,500ft; climb to 30,000ft, 8.65 min; typical range, 1,800 miles.

de Havilland Sea Hornet 21.—Span, 45ft; flying weight, 19,360 lb; power plant, two Rolls-Royce Merlin 130/31; armament, four 20 mm guns plus bombs or R.P.s; max. speed, 462 m.p.h. at 22,000ft; initial rate of climb, 4,650 ft/min; typical range, 1,500 miles.

The trim-looking radial-engined biplane on the right is the Gloster Sea Gladiator, with Bristol Mercury engine and four machine guns.

The Blackburn Skua (right) was used both as a fighter and as a dive-bomber. The Roc (below it) was a direct development.

The armament of the Blackburn Roc (right) was four machine guns — concentrated in the Boulton Paul dorsal turret. Eight fixed, wing-mounted machine guns formed the armament of the Fairey Fulmar fighter (lower right).



"Flight" photographs

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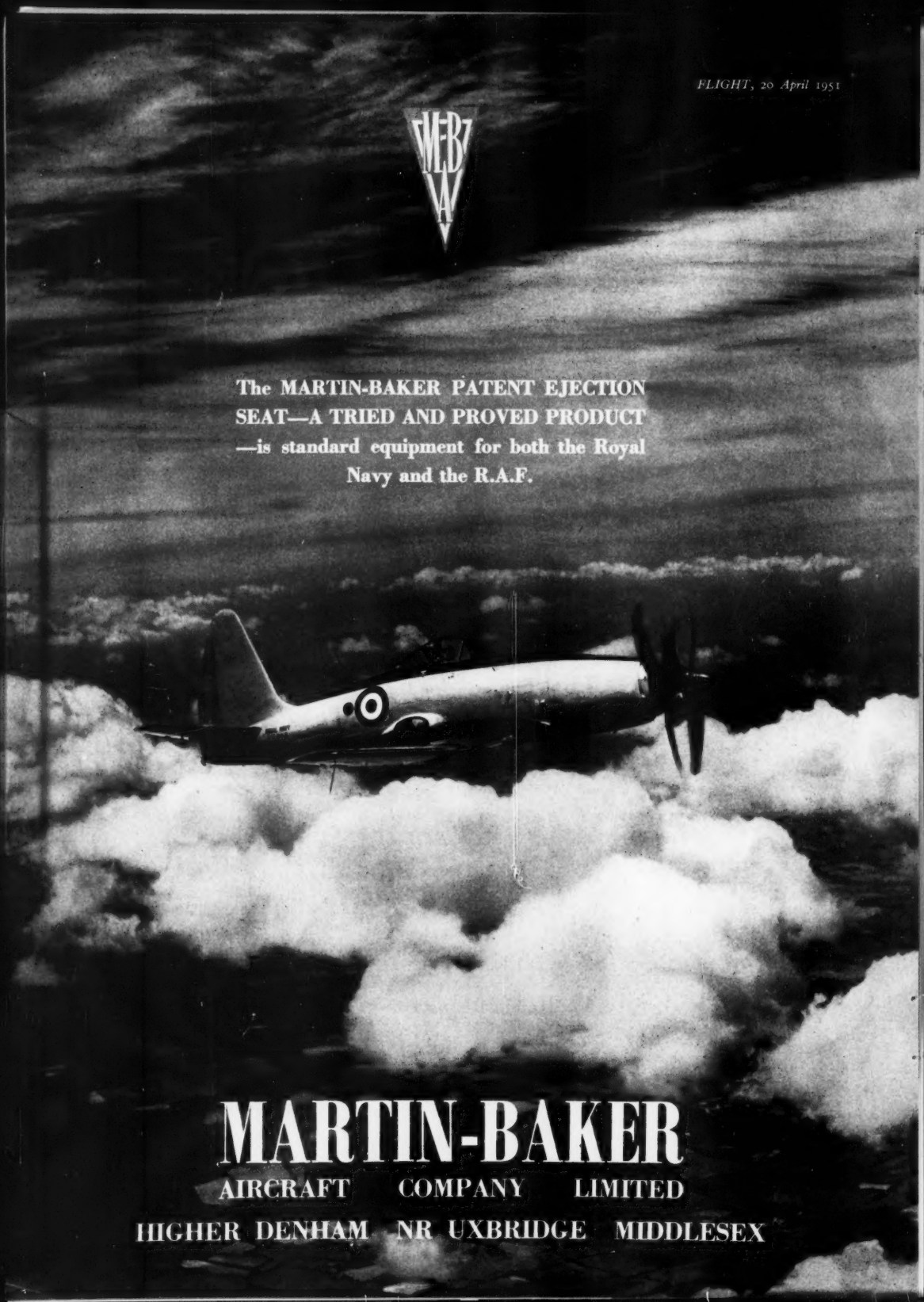
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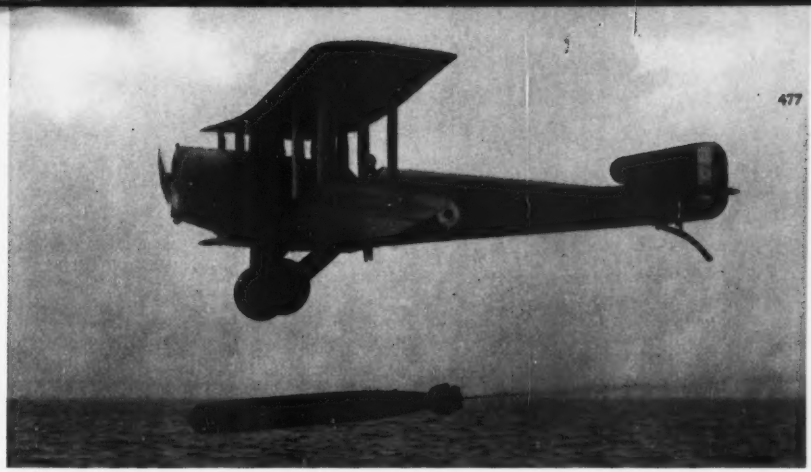


An early carrier-borne single-seater torpedo-dropping aircraft, the Blackburn-built Sopwith Cuckoo.

Strike Aircraft

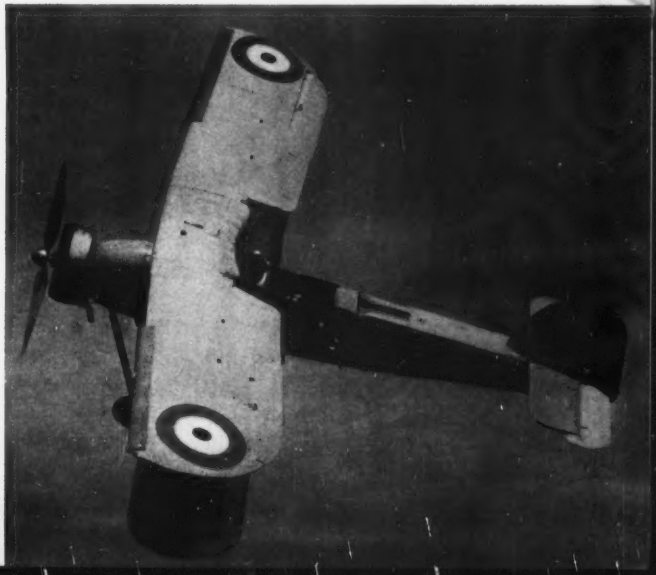
EARLY bomb-dropping and torpedo work by Naval aircraft is touched upon in the outline history on pages 467-473. Pioneer types of Sopwiths and Shorts were employed on a very limited scale as torpedo-carriers during the war of 1914, and seaplanes, landplanes and airships of various patterns were used for bombing land and sea targets.

The first aircraft designed specifically to operate with a torpedo from the deck of an aircraft carrier was the Blackburn-built Sopwith Cuckoo, a single-seater biplane—so named, it is said, because a Sopwith egg was hatched in the Blackburn nest. The Cuckoo was intended to go to sea in H.M.S. *Argus*, but the war ended before it could prove itself in operation. The Blackburn Blackburd of 1918 was built for similar duties aboard *Argus* and, in the absence of arrester gear, was arranged to drop its wheels after take-off and to land on skids. Hydrovanes were provided on the undercarriage for emergency alightings on water.

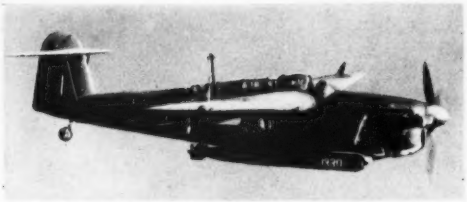
The single-seater formula persisted in the later Blackburn Dart, which many of today's senior Naval pilots remember nostalgically. It was, as our picture shows, of somewhat plain aspect, but with a rather appealing retroussé nose; it was the last single-seater strike aircraft in British Naval service until the advent of the monoplane Firebrand from the same stable. Successor to the Dart was the trim-looking two-seater Ripon, with water-cooled Napier Lion, which in its turn gave way to the similar, but Pegasus-powered, Baffin. So versatile were these two-seaters that the authorities were encouraged to order three-seater "T.S.R.s," capable of functioning in the torpedo-dropping, spotting and reconnaissance roles. Two types—the Fairey Swordfish (Bristol Pegasus) and Blackburn Shark (Armstrong Siddeley Tiger) were put into service.

The Blackburn Dart, with Napier Lion engine.

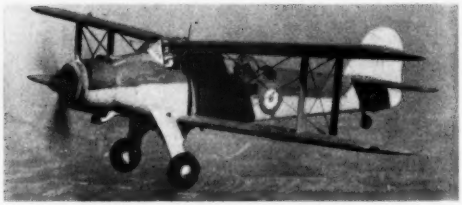
The Swordfish operated not only with torpedo or bombs (these loads were alternatives) but with rocket projectiles, depth charges, special radar, and other trimmings which did much to enhance its usefulness and—since it was not designed for high speeds—detracted very little from its performance. The next Fairey strike machine was the Albacore, a cleanly



The Blackburn Baffin torpedo/bomber, above, strongly resembled the earlier Ripon, but had a Bristol Pegasus radial in place of the water-cooled Napier Lion. (Right) An early Fairey Swordfish torpedo-spotter-reconnaissance 3-seater (Pegasus). Contemporary—and competitive—with the Swordfish was the A.S. Tiger-powered Blackburn Shark (below).
"Flight" photographs



The Fairey Barracuda (Rolls-Royce Merlin) succeeded the Swordfish and Albacore. A number of Barracudas are still in service.

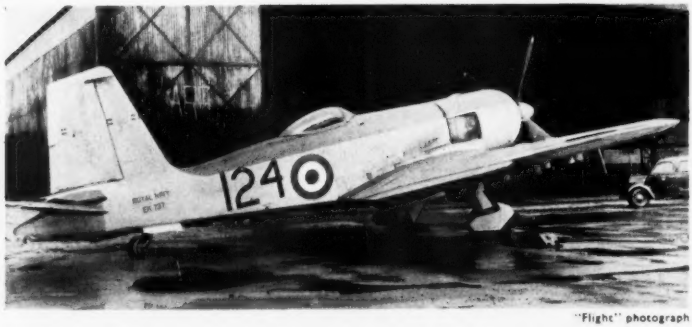


The Albacore (Taurus) was later in design than the Swordfish, but was "retired" sooner. The type rendered good service in the late war.

Strike Aircraft . . .

designed biplane with Bristol Taurus sleeve-valve engine and pilot's cockpit in line with the leading edge of the top wing; then followed the monoplane Barracuda, which represented a notable advance in performance. A contemporary was the experimental Supermarine 322 "Dumbo," which, notwithstanding a fixed undercarriage, was of commendably clean design and was characterized by a variable-incidence wing, as on the same company's Seagull amphibian. Later still the de Havilland Mosquito was adapted to carry a torpedo; but the Sea Mosquito, as it was known, was not used operationally from carriers.

The Blackburn Firebrand single-seater monoplane (Bristol Centaurus) was a direct development of a Sabre-engined fighter, and retained the full fighter armament of four 20 mm guns. It will continue in service as the standard aircraft of its class until the arrival of Wyverns, now in production at the Westland works. The Wyvern is a very cleanly designed, low-wing single-seater, powered with an Armstrong Siddeley Python turboprop and armed with four 20 mm guns. Carrying a full armament load of torpedo plus 16 rocket projectiles, a Wyvern performed aerobatics at the last S.B.A.C. Display with the grace and ease of a much lighter and smaller machine. It is not perhaps generally realized that, although the span of 44ft is little more than the Hurricane's, the Wyvern is a very much heavier machine. In addition to the Youngman three-position flaps there are split flaps to assist deck landings. Performance figures for the production version of the Wyvern may not be quoted, but the original Wyvern T.F.1, with Rolls-Royce Eagle piston engine, attained a maximum speed of 455 m.p.h.



"Flight" photograph

The two adjacent photographs depict the present and future single-seat torpedo fighters of Naval Aviation. (Right) The Blackburn Firebrand T.F.5a (Bristol Centaurus); below, Westland Wyvern T.F.2 (Armstrong Siddeley Python turboprop).

The Percival Sea Prince fitted with Alvis Leonides engines

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The versatility of the "PRINCE" is exemplified by the ease with which the "Sea Prince" has been fitted out as a 'Flying Classroom' with Radar, Radio and Navigating Equipment, for training operational aircrews.

In quantity production with the civil eight to twelve passenger and aerial survey versions of the "Prince", the "Sea Prince", powered by Alvis "Leonides" engines, is the standard communications aircraft and flying classroom of the ROYAL NAVY.

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CHANTRELL

Short reconnaissance seaplanes—typified by the old warrior above (with Canton-Unné engine)—performed marvels in the first world war.

General Reconnaissance and Anti-submarine

IN general it can be said that the reconnaissance and gunnery-spotting aircraft of the 1914 war were near-relations of the types used for bombing and torpedo-dropping. It was, however, recognized as the war progressed that the navigator and/or observer were deserving of less spartan accommodation that these very early types provided, and after the war the Westland company was asked to adapt a D.H.9A bomber, as used in the R.A.F., to serve as a three-seater carrier-borne reconnaissance machine. It was no fault of the company that this attempt did not succeed; with its air bags, balconies, bumps, pipes, hydrovanes, tanks, and other fitments despoiling the clean-cut "Nine-ack" lines, the Walrus, as the conversion was fittingly named, is seen in the accompanying picture to be a monument to makeshift.

A totally new approach to the problem was discernible in the Blackburn Blackburn and Avro Bison, with their roomy cabins, wherein the navigator could plot away with the minimum of disturbance.

For "fleet-spotter-reconnaissance" duties (to quote the official styling) Faireys developed a carrier-borne version of

The bewhiskered Westland Walrus (adaptation of D.H.9a) may be compared with the Wyvern illustrated on page 478.

"Flight" photograph

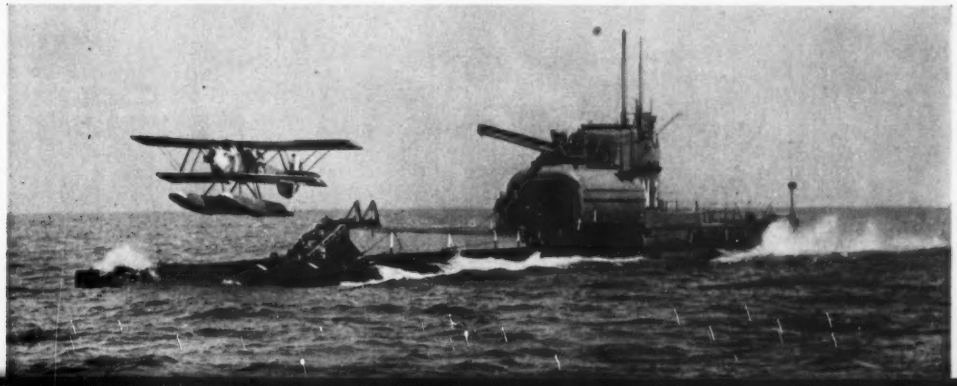
Portly companion of the Blackburn below—the Avro Bison, also with a Lion. Note the generous area of the cabin windows.

Homely in appearance and accommodation—the Blackburn Blackburn.

"Flight" photograph

The Fairey IIIF (Lion) was used with twin-float or wheel undercarriage.

The "Flight" photograph below shows the little Parnall Peto two-seater light-reconnaissance seaplane leaving the catapult of the submarine M.2.



General Reconnaissance and Anti-submarine . . .

the IIIF general-purpose machine, likewise with Napier Lion. The succeeding type—the Seal—was generally similar except that the Panther engine was installed.

A unique reconnaissance floatplane was the little Parnall Peto (Armstrong Siddeley Mongoose engine), which operated from the submarine M.2, wherein the original gun turret was displaced by a hangar and catapult.

For operation from the lighter classes of cruiser the Fairey Sea Fox was introduced on a limited scale. This sturdy little machine had a Napier Rapier engine of H-formation and will be remembered for its splendid work in the *Graf Spee* action. The Hawker Osprey, officially a "fighter/reconnaissance" type, was extensively used in its day for scouting from carriers and other warships. In their time, also, the Swordfish and Shark T.S.R.s rendered excellent service in the reconnaissance role. Later, for high-speed photographic-reconnaissance work, standard types of Naval fighter were equipped with cameras and today there is a special version of the de Havilland Sea Hornet—the P.R.22.

Passing reference may be made to two *four-engined*, deck-landing, ultra-slow-flying, "fleet-shadower" aircraft, produced experimentally by Airspeed and General Aircraft.

The work of the Swordfish and other types in locating and attacking U-boats during the late war was as splendid and dramatic in its way as the victory of the R.A.F. in the Battle of Britain. Since the war the under-sea menace has, naturally, loomed large in Naval/air planning, and specifications were issued for a modern carrier-borne aircraft capable of carrying the latest locating equipment and anti-submarine weapons. To meet the requirements laid down Fairey produced their G.R.17, and Blackburn the Y.B.1. The former company now has the "17" in full production.

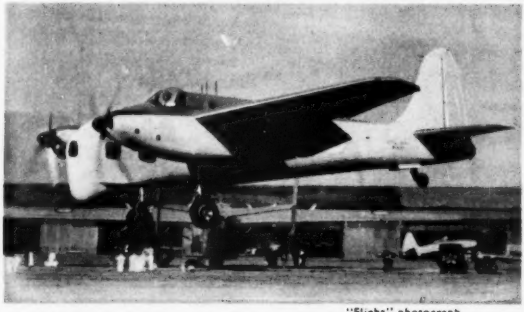
The service version of the new Fairey is a three-seater. The "radome" is retractable into the fuselage astern of the rear cockpit, and anti-submarine weapons, certain of which are secret, are stowed in a remarkably capacious bomb-bay.

The Fairey 17 is one of very few aircraft literally designed round the power plant. Its Armstong Siddeley Double Mamba turboprop is mounted low in the deep fuselage, the residual gases being discharged on both sides of the fuselage astern of the wing trailing edge. The two units of the Double Mamba can operate quite independently, and for normal cruising flight one is shut down completely, the stationary airscrew being feathered to minimize drag. There have been instances when, at comparatively light load, the machine has taken off on one unit alone. This turbine power-plant arrangement makes not only for operating economy but, by virtue of its smooth running, should result in far less wear and tear on instruments and other delicate equipment.

Pending arrival of Fairey 17s, Naval anti-submarine squadrons are making good use of Firefly Mk 5 and 6 two-seaters. A specialized three-seater Firefly for "A.S." duties was stated in March to be under development.

A Fairey Firefly (Griffon engine) gets away with RATOG assistance. For anti-submarine work a 3-seater Firefly is under development.

Blackburn Y.B.1 prototype (Armstrong Siddeley Double Mamba). Note capacious bomb-bay and dihedral tailplane to clear jet streams.



"Flight" photograph

Short S.B.3 experimental anti-submarine aircraft (two Armstrong Siddeley Mambas). The nose-mounted radar is a desirable feature.

An unusually fine landing-on study of a Fairey 17. This type is in quantity production for carrier-borne anti-submarine squadrons. Note the neat installation of the Double Mamba, generous flap area and pilot's field of view forward and downward.

Ray Cranmer

Striking Down A Sea Hawk jet fighter goes down the for'ard lift. Naval Squadrons will soon be operating these aircraft.

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ROYAL NAVY

ROTOL SALUTES THE ROYAL NAVY

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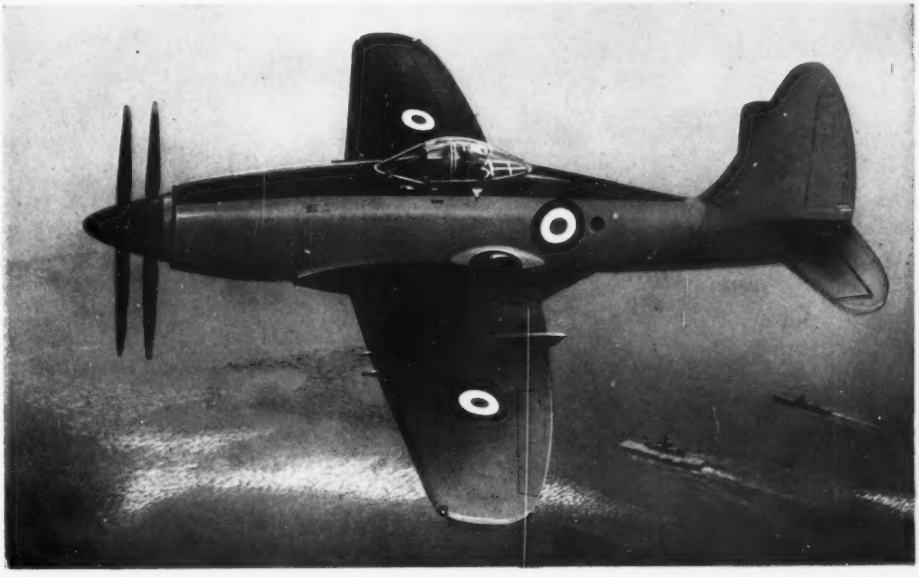

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TURBO-PROP FIGHTER
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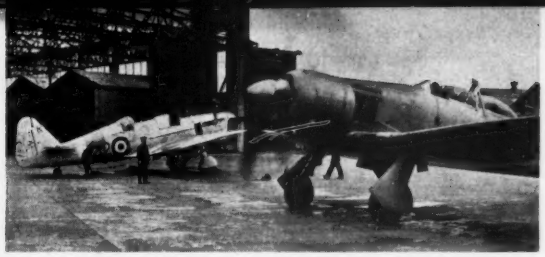
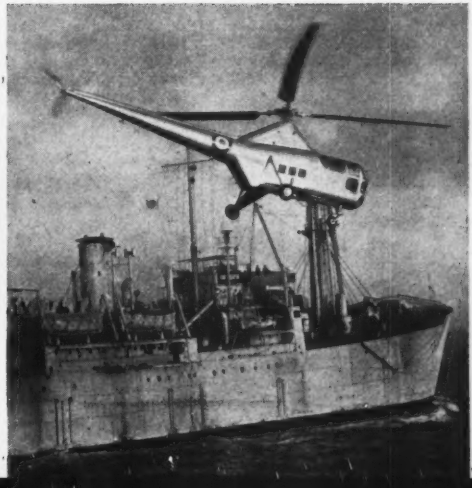
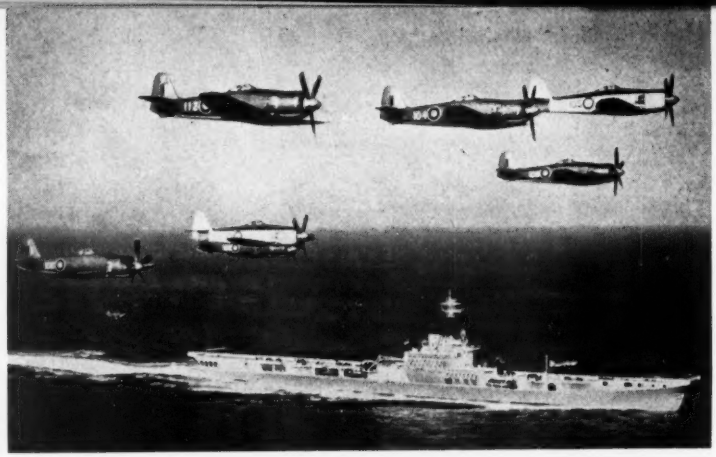
For Miscellaneous Duties

IN support of the first-line machines introduced in the foregoing pages several types of training, communication, target-towing and air/sea rescue aircraft are in every-day use. The *Flight* photograph heading the page shows a Hawker Sea Fury T.20 advanced trainer (right) taxying past a dual-control Fairey Firefly. The handsome twin-engined monoplane in the next picture is the Percival Sea Prince (two Alvis Leonides engines) for instructional and communications work, and the two amphibians are the standard Supermarine Sea Otter biplane and the experimental Seagull. Then come a Short Sturgeon T.T.2 deck-landing target-towing and target-simulating aircraft and, seen in side view, a D.H. Mosquito adapted for similar duties from shore bases. Finally there is a Westland-Sikorsky Dragonfly helicopter, used for air/sea rescue and miscellaneous duties. It has taken off from a platform over the stern of the supply ship *Fort Duquesne*.







Sea Furies of 20th Carrier Air Group with their carrier, H.M.A.S. "Sydney". A Firefly can be seen about to take-off, whilst another is about to land-on.

COMMONWEALTH NAVAL AVIATION

Flying Activity in the Royal Canadian and Australian Navies

IN order to round off the picture presented in this issue, reference is made here to the flying activities of the Royal Canadian and Royal Australian Navies.

Aviation in the Royal Canadian Navy dates back to 1918, when a Naval Air Service was formed; this arm was disbanded in the following year, when strength was reduced in line with peace-time policy, and it was not until 1943 that the question of aviation in the R.C.N. was again mooted. Captain (now Commodore) H. N. Ley, O.B.E., R.C.N., carried out a comprehensive investigation of the problems involved, as a result of which the R.C.N. manned two war-time aircraft carriers, H.M.S. *Nabob* and *Puncher*. Whilst the aviation in these ships was carried out by R.N. personnel, a considerable number of Canadian aircrew and ground crew had in the meantime been trained and were serving with the Royal Navy. These Canadians, together with a considerable number of aircrew recruited from the R.C.A.F. toward the end of the war, formed the nucleus of naval aviation in the Royal Canadian Navy.

It was just two months after naval aviation was officially constituted in the R.C.N. (September, 1945) that Lt. R. H. ("Hammy") Grey, D.S.C., R.C.N.V.R., whilst serving in H.M.S. *Formidable*, won the only V.C. awarded to a member of the Canadian Navy, thereby furnishing the fledgling organization with a tradition of the highest order.

The first aircraft carrier to be manned entirely by Canadians was H.M.C.S. *Warrior* which, commissioned during the latter part of 1945, was returned to the Royal Navy in 1947 in exchange for the light fleet carrier H.M.C.S. *Magnificent*. In addition to this ship, the R.C.N. has a Naval Air Station at Dartmouth, Nova Scotia, and embodies two Carrier Air Groups (equipped with Sea Furies, Fireflies and Avengers) and a Training Air Group. At the present time, Canadian Naval aviation is concentrating on training in anti-submarine warfare and is building up an efficient organization capable of rapid expansion so that, in an emergency, the R.C.N. will once again be able to protect the life-line to Europe in as efficient a manner as it has in the past.

Aviation became established in the Royal Australian Navy in May, 1949, when the R.A.N.'s first aircraft carrier, H.M.A.S. *Sydney*, arrived at Jervis Bay, N.S.W., on her initial voyage to Australia from the United Kingdom. She had on board the 20th Carrier Air Group, which had been formed in England with R.N. and R.A.N. personnel, aircraft belonging to the Air Group, reserve aircraft and naval stores. All these were disembarked for the R.A.N.A. Station at Nowra (H.M.A.S. *Albatross*), which lies 22 miles inland from Jervis Bay in an isolated part of the Australian bush.

The arrival of *Sydney* was the climax to more than two years of intensive preparatory work which had been begun by Commodore (now Rear-Admiral) E. W. Anstice, C.B., R.N.—the present Flag Officer Flying Training of the Royal Navy—and a staff of R.N. officers. In May last year, *Sydney* returned to the United Kingdom to embark the 21st Carrier Air Group, also comprised of R.N. and R.A.N. personnel, but with a larger proportion of the latter than the 20th C.A.G. She also embarked more reserve aircraft and stores.

Whilst *Sydney* was absent, the 20th C.A.G. was engaged in shore-based training at Nowra, where it remained until shortly after the carrier returned with the 21st C.A.G. It then embarked for flying training at sea, and recently took part in exercises with ships of the Australian Fleet and New Zealand Squadron, and units representing the navies of other Dominions which were visiting Australia for the Commonwealth Jubilee celebrations.

The 20th Carrier Air Group has already won a sound reputation for its operational quality, and it is confidently expected that a similar reputation will be gained by the 21st C.A.G. Naval aviation in the Royal Australian Navy will eventually be strengthened by the acquisition of a second carrier, H.M.A.S. *Melbourne*, which is at present being completed in England.

This beautiful study shows H.M.C.S. "Magnificent" lying at anchor in a flat calm in the harbour at Halifax, Nova Scotia.

FLY WITH THE FLEET

—*as a Naval Officer*

THE ROYAL NAVY wants young men to train for the exciting job of flying the latest Naval aircraft as Officer Pilots and Observers. Men with the qualifications shown below can enter for a commission of 8 years.

An unmarried officer is paid £9 per week as soon as he qualifies for flying duty, and pay rises fast with experience . . . a married Lieutenant aged 25 years with 3 years seniority can earn just under £1,000 a year. At any time after 4 years service, a number of officers will be offered permanent commissions, others may be given the opportunity of being selected for posts in civil aviation.

All officers who leave the Service after 8 years receive a gratuity of £1,500 tax free.

The present entry list closes on 1st July, 1951, and the next on 1st October. Post this coupon for full details.

TO OLDER MEN. If you know any young men who have the qualifications shown below you will be doing them a good turn by telling them of this fine opportunity in Naval Aviation.

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Please send me, without obligation, a free copy of 'Fly with the Royal Navy' which gives full details of short Service Commissions as Pilot or Observer in the Royal Navy. I am between 17 years 4 months and 24 years old ; physically fit ; passed School Certificate with credit in Maths.

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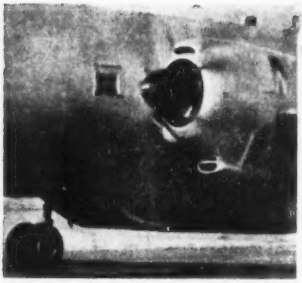

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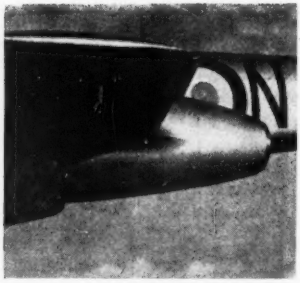

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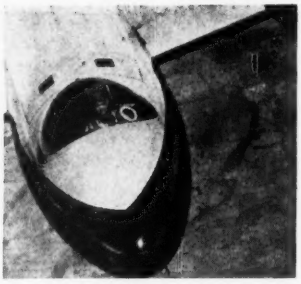

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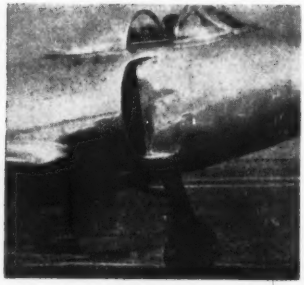

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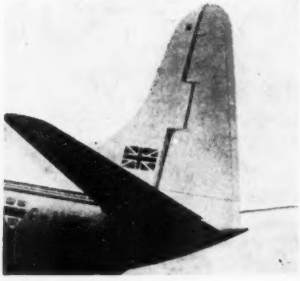

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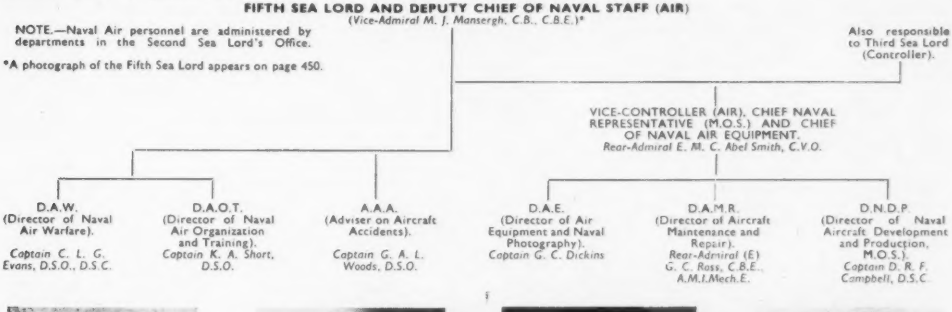
NAVAL AVIATION ORGANIZATION

WITHIN the Admiralty, under the Fifth Sea Lord, are the several divisions concerned with the basic requirements appertaining to an air force, and close liaison is maintained with the Ministry of Supply. Implementation of Admiralty air policy is vested in the Commanders-in-Chief of the fleets, and in the Flag Officer Air (Home).

Admiralty Organization . . .


FIFTH SEA LORD AND DEPUTY CHIEF OF NAVAL STAFF (AIR)
(Vice-Admiral M. J. Mansergh, C.B., C.B.E.)*
NOTE.—Naval Air personnel are administered by departments in the Second Sea Lord's Office.
*A photograph of the Fifth Sea Lord appears on page 450.
Also responsible to Third Sea Lord (Controller).
VICE-CONTROLLER (AIR), CHIEF NAVAL REPRESENTATIVE (M.O.S.) AND CHIEF OF NAVAL AIR EQUIPMENT.
Rear-Admiral E. M. C. Abel Smith, C.V.O.
D.A.W. (Director of Naval Air Warfare). Captain C. L. G. Evans, D.S.O., D.S.C.
D.A.O.T. (Director of Naval Air Organization and Training). Captain K. A. Short, D.S.O.
A.A.A. (Adviser on Aircraft Accidents). Captain G. A. L. Woods, D.S.O.
D.A.E. (Director of Air Equipment and Naval Photography). Captain G. C. Dickins
D.A.M.R. (Director of Aircraft Maintenance and Repair). Rear-Admiral (E) G. C. Ross, C.B.E., A.M.I.Mech.E.
D.N.D.P. (Director of Naval Aircraft Development and Production, M.O.S.). Captain D. R. F. Campbell, D.S.C.

Captain C. L. G. Evans

Captain K. A. Short

Rear-Admiral E. M. C. Abel Smith

Captain G. C. Dickins

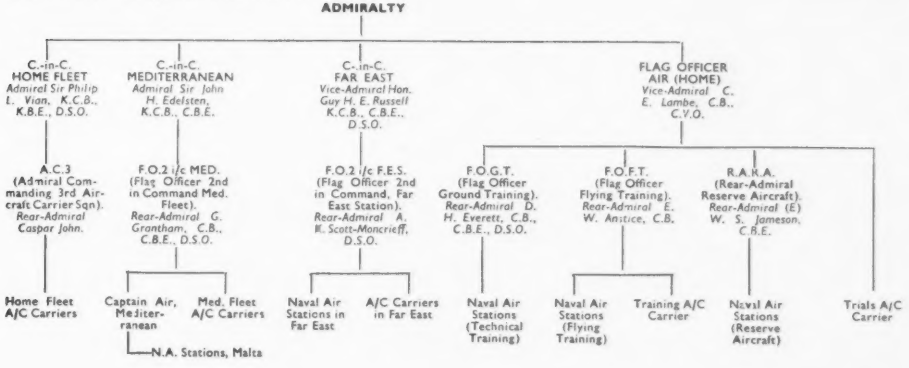
Captain D. R. F. Campbell

Rear-Admiral D. H. Everett

Rear-Admiral E. W. Anstice

Rear-Admiral (E) W. S. Jameson

Command Organization . . .


ADMIRALTY
C.-in-C. HOME FLEET Admiral Sir Philip L. Vian, K.C.B., K.B.E., D.S.O.
C.-in-C. MEDITERRANEAN Admiral Sir John H. Edelsten, K.C.B., C.B.E.
C.-in-C. FAR EAST Vice-Admiral Hon. Guy H. E. Russell K.C.B., C.B.E., D.S.O.
FLAG OFFICER AIR (HOME) Vice-Admiral C. E. Lambe, C.B., C.V.O.
A.C.3 (Admiral Commanding 3rd Aircraft Carrier Sqn). Rear-Admiral Caspar John.
F.O.2 i/c MED. (Flag Officer 2nd in Command Med. Fleet). Rear-Admiral G. Grantham, C.B., C.B.E., D.S.O.
F.O.2 i/c F.E.S. (Flag Officer 2nd in Command, Far East Station). Rear-Admiral A. R. Scott-Moncrieff, D.S.O.
F.O.G.T. (Flag Officer Ground Training). Rear-Admiral D. H. Everett, C.B., C.B.E., D.S.O.
F.O.F.T. (Flag Officer Flying Training). Rear-Admiral E. W. Anstice, C.B.
R.A.R.A. (Rear-Admiral Reserve Aircraft). Rear-Admiral (E) W. S. Jameson, C.B.E.
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Captain Air, Mediterranean
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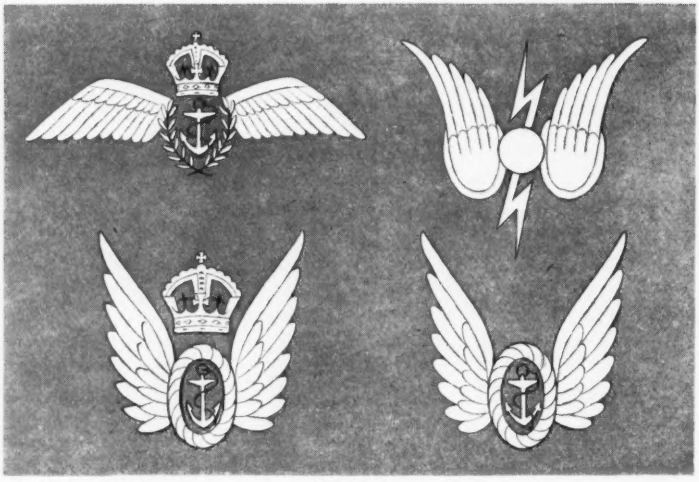
N.A. Stations, Malta
Naval Air Stations in Far East
A/C Carriers in Far East
Naval Air Stations (Technical Training)
Naval Air Stations (Flying Training)
Training A/C Carrier
Naval Air Stations (Reserve Aircraft)
Trials A/C Carrier

NAVAL AVIATION INSIGNIA

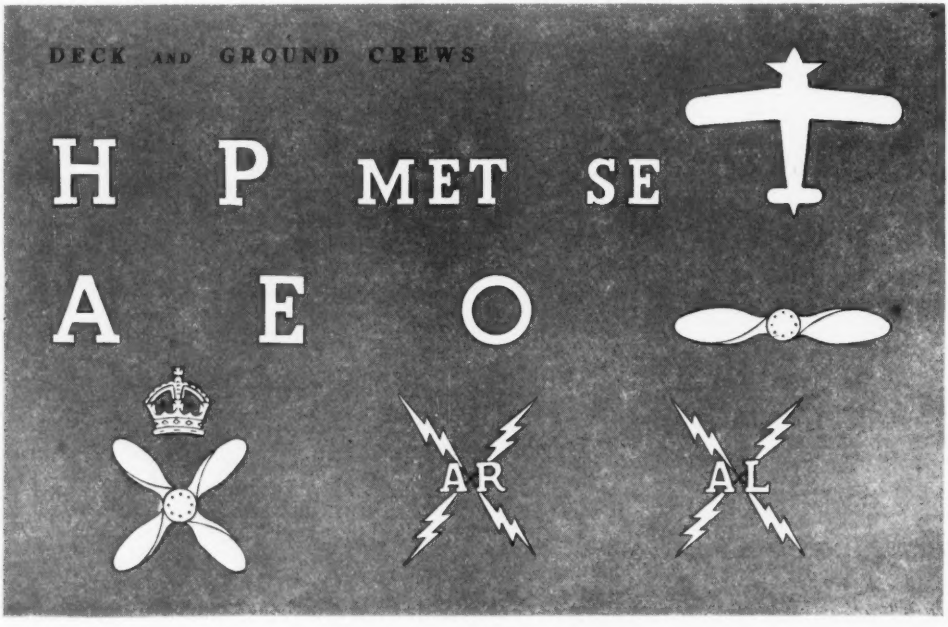
Identifying the Men who Fly and those who Keep them Flying

FLYING PERSONNEL



OF the four adjacent insignia, the two on the left are, respectively, those of pilot and observer—or, in the latter case, when worn by a petty officer or chief petty officer, "Aircrewman". The other two together (upper on sleeve, lower on cuff) are those denoting "telegraphist (flying)"; these men are responsible for operating airborne wireless and radar. If worn by itself, the lower badge denotes "Aircrewman (unqualified)".

THE miniature aircraft at upper right, among the insignia below, distinguishes the Naval airman. It is worn with the appropriate letter underneath: thus "H" denotes aircraft handler; "P", photographer; "MET", meteorological observer; "SE", safety-equipment rating; "A", "E" or "O", mechanic (airframe), mechanic (aero-engines) or mechanic (armament). The two-bladed airscrew is worn on the cuff by pilot's mates. Aircraft mechanicians display the four-bladed "prop", with crown superimposed. Aircraft artificers wear no arm-badge. The "AR" and "AL" devices, respectively, are those of the radio electrician (air) and electrician (air) ratings. No arm badge is worn by the electrical artificer (air) or radio electrical artificer (air).



SERIAL 3

S 11 TRAINER HAWKER SEA FURY and GLOSTER METEOR production — photos by courtesy of N.V. Koninklijke, Nederlandsche Vliegtuigenfabriek Fokker, Holland.

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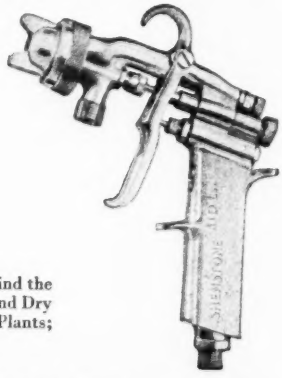

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FLYING CAREERS IN THE NAVY

Aircrew and Ground-crew Organization and Methods of Officer and Rating Entry

A THREE-BADGE able seaman was once heard to remark to his pal, on watching an aircraft make a somewhat heavy landing on the pitching deck of a carrier, "Only birds and b—— fools fly."

That remark might be said to reflect the attitude of many Naval men to flying in the early years—and, for that matter, the attitude of many other people. Today the position is vastly different. Airmanship has become as much part of Naval life as seamanship, gunnery or under-water warfare. A large percentage of Executive officers are trained pilots or observers and they range in rank from full Admiral to Sub-Lieutenant. Many senior officers, who are not qualified aviators, have had direct experience of Naval Aviation as a result of having been in command of a carrier or a Naval Air Station. The frequently quoted fact that over one quarter of the Navy's total manpower is concerned in some way or another with Naval Aviation is, perhaps, the most convincing evidence of the degree to which the Royal Navy of today has become "aviationized." Readers may, therefore, be interested in the following outline of the various forms of officer and rating entry.

Today all new-entry Naval pilots and observers are officers and they are drawn from two main sources. They are either permanent-service Executive officers (cadet-entry or promoted from the lower deck), who decide to specialize in aviation instead of in one of the older branches such as navigation or communications, or short-service Executive officers who are entered specifically for aircrew duties. In addition, a few Engineer and Royal Marine Officers are trained as pilots.

The permanent-service officer, like all other permanent officers who specialize, is employed almost wholly in a specialist capacity, up to and including the rank of Lieutenant-Commander. Subsequently he may receive either a specialist or general-service appointment. Not more than half the Executive Commanders are, for instance, in specialist appointments and the proportion drops rapidly in the case of Captains and is still smaller in the case of Flag Officers.

Short-service officers are trained initially in aircrew duties only, but are given opportunities during their service to gain experience in seamanship and other subjects which constitute the basic training of the permanent Executive Officer. When they have obtained these qualifications, short-service officers are equally fitted for all appointments within the Executive Branch and those who are granted permanent commissions are eligible for promotion to the highest ranks. As a temporary measure, the Admiralty is also inviting a limited number of ex-Naval pilots to return to the Service for flying duties for a period of four years.

Air Traffic Control Officers are also drawn from the Executive Branch. They have either had flying experience or are ex-aircrew or Aircraft Handler ratings who have been promoted to commissioned rank. Maintenance work on Naval aircraft is the responsibility of Engineer and Electrical officers and the stores side is looked after by officers of the Supply and Secretariat Branch. In all cases, officers who specialize tend to revert to general-service duties within their branch as they reach senior rank.

Naval Aviation ratings belong to several different branches and, like all other ratings, remain in their particular branch throughout their career on the lower deck. There are, however, good prospects of promotion to commissioned rank for suitably qualified men, and those who are selected receive the same wide general training in the work of their Branch and have the same opportunities for promotion as do all other permanent officers.

The various forms of entry are outlined below.

Officers

Cadetships.—Cadetships for permanent commissions in the Executive, Engineering and Supply & Secretariat Branches are available to boys and young men between the ages of 16 years and 16 years 8 months and between 17 years 8 months and 18 years 4 months at the time of entry into Dartmouth. Cadetships are awarded according to marks gained in a written examination and in aptitude tests.

Cadetships in the Electrical Branch are open to those between 17 and 19 years of age on September 1st of the year of entry into Dartmouth and are awarded according to marks gained in aptitude tests only. Candidates must, however, be in possession of certain educational qualifications.

Short-Service Commissions.—Short-Service commissions in the Executive Branch as pilot or observer are open to young men between the ages of 17 years 4 months and 24 years. These commissions are for 8 years on the Active List and 7 years on the Emergency List. A certain proportion of officers are granted permanent commissions and the remainder are paid a gratuity of £1,500 when they leave the Active List.

In addition to this scheme, the Admiralty is now inviting a limited number of ex-Naval pilots under the age of 33 to return to the Service for flying duties for a period of 4 years, which may be increased to 6 years in some cases. A gratuity, which amounts to £700 for four years' service, will be paid at the end of the commission.

Ratings

Artificers.—Artificers are the Navy's most skilled ratings and three types of Naval Artificer—Aircraft, Electrical (Air) and Radio Electrical (Air)—are concerned with Naval Aviation. The great majority of Artificers enter the Service as Apprentices and serve a full trade-apprenticeship of 4 years. They receive one year's general training and are then selected for a particular branch, according to their choice and aptitude and the needs of the Service. Apprenticeships are awarded according to marks gained in a written examination and in aptitude tests. Candidates must be between the ages of 15 years and 16 years 8 months at time of entry. Direct entry as artificer is open to qualified men between the ages of 19½ and 28.

Naval Airmen.—The Naval Airman Branch provides the great bulk of Naval Aviation ratings and its members are divided into five categories—Mechanics, Aircraft Handlers, Safety Equipment Ratings, Photographers and Meteorological Observers. The titles of the different categories clearly indicate the type of work they do; Mechanics form 75 per cent of the whole, and the best are selected for training as Pilot's Mate. They are then made responsible for the maintenance of the aircraft flown by one particular pilot and, as a further step in advancement, may be selected for training as Aircraft Mechanicians. If so, they are given a training to fit them to undertake the duties performed by Aircraft Artificers.

Entry into the Naval Airman Branch is open to young men between 16½ and 23 years of age. There are two types of engagement—the Continuous Service Engagement which is for 12 years with the Fleet, and the Special Service Engagement which is for 12 years, 7 years of which are served in the Fleet, in addition to whatever period may be necessary before attaining the age of 18, and the remainder in the Royal Fleet Reserve.

Electrical Branch.—Ratings of this Branch are divided into two categories—Electricians and Radio Electricians. Those who are trained to work on the equipment of aircraft add (Air) to their category title. Entry regulations are the same as for Naval Airmen.

Telegraphists (Flying).—A limited number of Telegraphists are normally required for aircrew duties. They are drawn from general service Naval Telegraphists who volunteer for short periods with Naval Aviation. At present, entry into the R.N. as Telegraphist is confined to the Seaman Boy entry, age limits 15-16½. A certain proportion of Seaman Boys are selected for the Communications Branch and are trained as either Visual Signalmen or Telegraphists. Seaman Boys enter on a Continuous-Service Engagement, but may transfer to a Special Service Engagement just before they reach the age of 18.

THE RESERVES

Although the question of careers does not arise, this brief survey would not be complete without reference to the R.N.V.R. Air Squadrons, which are the Navy's front-line reserve in the air. There are at present five squadrons, based in different parts of the country. Entry into the squadrons is as follows :

Officers

Aircrew.—There are still a few vacancies for qualified pilots and observers under the age of 35. The main source of recruitment will, however, in future be National Servicemen who are trained as pilot or observer during their full-time National Service and who are expected to join one of the R.N.V.R. Air Squadrons for their part-time service.

The main entry under this scheme is from young men over the age of 17½ who apply two months or so before they register for National Service. Deferred men can also be considered in certain circumstances. The other entry is from National Servicemen

FLYING CAREERS IN THE NAVY . . .

already in the Navy. After a short initial training at sea, both entries are made Midshipmen R.N.V.R. and are trained towards full operational standard during their full-time service. Suitable officers are allowed to transfer to short-service commissions if they wish.

Maintenance, etc.—Engineer, electrical, supply and other types of non-aircrew officer are recruited from ex-temporary R.N.V.R. officers with suitable qualifications. Commissions are also granted to ratings during their National Service or when serving with one of the R.N.V.R. Squadrons.

Ratings

Each Squadron has its establishment of maintenance and other ratings. Entry is open to men under 45 years of age with previous similar experience in the R.N. or R.A.F. and to young men over 17 years of age who can complete one year's training commitments in the R.N.V.R. before they are called up for National Service. On condition that they reach the necessary standard of efficiency, these men are guaranteed acceptance by the R.N. for their National Service. Entry into the R.N.V.R. Squadrons is also open to men not over 26 years of age, or 28 in the case of tradesmen, who have had no previous service and are deferred or exempt from National Service.

Details of entry into Naval Aviation are obtainable from the following authorities :

Royal Navy: All types of officer entry—C.W. Branch, Admiralty, London, S.W.1; all types of rating entry—Director of Naval Recruiting, Admiralty, London, S.W.1.

R.N.V.R. Air Squadrons: Officer and rating entry—Admiral Commanding Reserves, Admiralty, London, S.W.1.

CORRESPONDENCE

The Corporations and Charter Operations

IT is time to debunk the unrealistic nonsense that is voiced so loudly in aviation circles today on the subject of the Corporations' non-scheduled activities. The war-cry of "Private Enterprise" (incidentally, one to which I subscribe) is uttered too often and by too many people who are not sufficiently experienced in, or well informed enough to relate it to, specific enterprises; and, therefore, they often manage to do their "cause" more harm than good.

It is the job of each Corporation, amongst other responsibilities, to earn money, and, under its existing structure, to cost the taxpayer as little as possible. As an ex-B.O.A.C. employee I have known in the past the frustration of being unable to compete in the charter market because every quotation was so weighted with overheads that it was farcical to submit it to a possible client. Thank goodness that situation has changed.

What are the Corporations supposed to do—stay out of the charter market when they have aircraft and aircrew available to put to good use by earning revenue, or so weight their charter rates with overheads that they price themselves out of the market? Such action might ensure that in some cases the business goes to charter companies. It might also ensure, in many cases, that the passenger, or goods, do not move by air at all. Or is it suggested that the Corporations shall quote only when a charter company cannot or does not want to quote? Hardly very practical or very businesslike.

From their critics, one hears so much of how economically and efficiently everyone but the Corporations can operate commercial aircraft. It seems reasonable to assume that on their charters the Corporations make either a profit (or a contribution to overheads—depending on one's approach to the matter) after payment of such basic operating costs as fuel, oil, landing and handling fees, catering and road transport, etc.

One would have thought, from all one has heard of the estimated ability of operators other than the Corporations, that they should be able to compete even without requiring the Corporations to load their quotations with the rental of airways terminals, etc. If by chartering their aircraft the Corporations can reduce their deficits, then good luck to them.

"Shabby treatment" and "questionable ethics" is tough talk by any standards. The judgment is stated to be based on fair and normal business practice. It is more likely that to some of the Corporations' critics the grapes are a trifle sour.

On the matter of airport overstaffing, I know little of the necessity, or otherwise, for an airport manager as well as an airport commandant; but to introduce into suggestions of airport overstaffing the presence of an airline station superintendent, as well as the other two officials, is as sensible as suggesting that a port needs no harbourmaster because a steamship line using it employs a marine superintendent.

Dublin. M. STUART-SHAW.

Airspeed History

MR. POWELL'S letter in *Flight* of March 30th gave me the idea that readers might also be interested in the histories of the Airspeed Ferries.

Four of these machines were built. The first two, G-ABSI and G-ABSJ, were constructed for Sir Alan Cobham, to be used on his National Aviation Day Campaign Tours. After two years of this work, G-ABSI was repainted a light pink, while G-ABSJ went on a tour to India. From this it never returned for, strangely enough, it was eaten by ants while there. G-ABSI was still flying for Sir Alan in 1935 and it was recoloured silver with blue struts, as before. After this last tour it had three Gipsy Major engines installed and was used in C. W. A. Scott's displays, successor to N.A.D. Tours. G-ABSI was being used just before the war by Portsmouth, Southsea and Isle of Wight Aviation, Ltd. Here I must make a slight correction to Mr. Powell's letter, for I believe I am correct in saying that P.S.I.O.W.A. were using seven Couriers, while the eighth machine was this Ferry.

The other two machines, G-ACBT and G-ACFB, were owned by Midland and Scottish Air Ferries. In 1934 this firm was closed and the two Ferries put up for sale at Renfrew. G-ACFB was put into service again by joining G-ABSI on C. W. A. Scott's displays. Later it was bought by Air Publicity, who were engaged in towing advertising banners behind Avro 504Ns. At the outbreak of war it was put out in the open at Heston, where eventually the elements destroyed it. G-ACBT was still lying at Renfrew.

Lancing, Sussex. JOHN JAKEMAN.

Footwear for Fitters

I WAS surprised to read in *Flight* of March 9th that, in a certain type of aircraft, plywood wing-skin failures were traced to the use of an insufficiently wide tread-mat, which had permitted fitters' boots to damage the surface. May I suggest that P.T. shoes, and not boots, should be worn by fitters?

Littlehampton, Sussex. KATHARINE BEARN.

[Some fitters, civil and Service, wear special soft shoes or overshoes. Ordinary rubber, however, may lead to slipping on oily floors or ladders, and can cause cold feet.—ED.]

Flight Simulators

ONCE again Mr. F. W. Barling has written to *Flight* (issue of April 6th) to point out that the R.A.F. has been using synthetic training for some years.

In the February 2nd, 1950, issue I replied to Mr. Barling's previous comments on this subject, pointing out that the first large-scale application of synthetic training put forward to the R.A.F. was made by Redifon, Ltd., in 1940, the same company which has now built and is installing B.O.A.C.'s Stratocruiser flight simulator.

P. ADORIAN,
London, S.W.1. Chairman, Redifon, Ltd.

Speed of Development

YOUR leader in *Flight* for April 6th includes the statement that "Moreover, it now takes, at the least, five years to design, build, test, develop, produce and deliver for service a given type of large civil aircraft."

No doubt the reasons why this should be would fill a volume of *Flight*, but that is no reason why this state of affairs should be accepted in Britain without question.

Perhaps one cause is that there are too many fingers in the designer's pie with, unfortunately, sufficient influence to compel changes in the design, which invariably require endless discussion and cause tedious delay. Another reason could possibly be that there is insufficient "hustle" in the industry in general, and problems which should have been tackled on Friday are left to lie over the week-end. This appears to be one sphere at least in which we could learn from our transatlantic friends.

Our aviation industry is on the crest of the wave with the Comet and the Canberra, and if the back-room boys are going to help Britain take advantage of it, they must work fast, as by now we should have a successor to the Comet in production. Those responsible for building, testing, developing, producing and delivering (those in your order !) must also learn to get a move on by speeding their planning and cutting their programmes.

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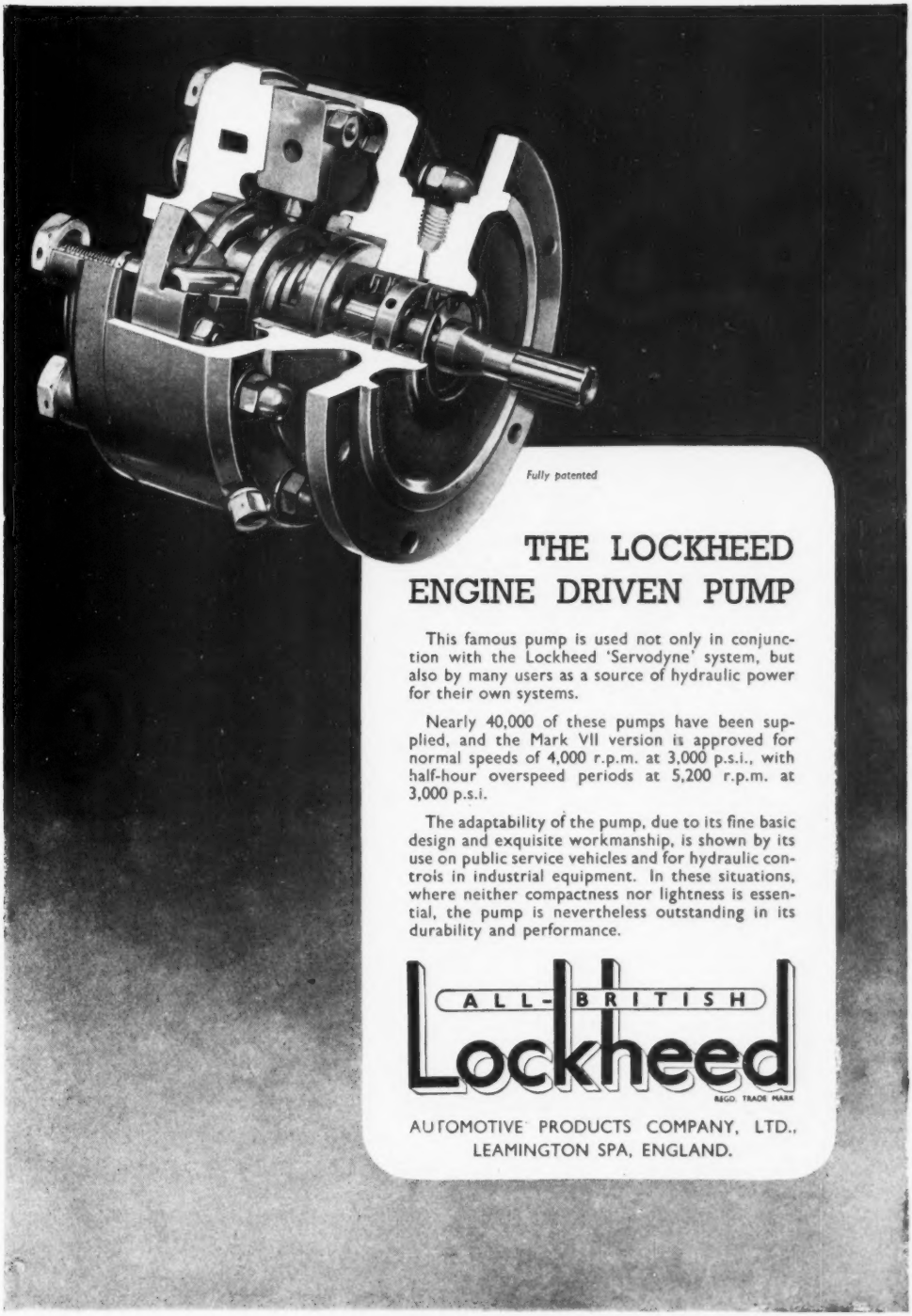

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Something new in horfes

I fee from my Claffical Dictionary — *said the Managing Director* — that I may aptly compare myfelf with the Ancient People of Theffaly. They too tamed horfes and fat on them as they fallied into battle. Their foes faw what feemed to be a fingle creature half man and half horfe, and fo arofe the legend of the Centaurs. But, of courfe *they* were very naughty horfes who fpent their time chafing nymfs. Not at all like *my* Little Horfes who work in Defoutter Tools all day and all night and *never* go out on the loofe.

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SERVICE AVIATION

Royal Air Force and Naval Aviation News

FOR IMMEDIATE ACTION: South Koreans re-arm a Mustang of No. 77 Squadron, R.A.A.F., in preparation for a ground-attack sortie. This Australian unit, now converting to Meteor 8s, has won a fine fighting reputation since its arrival in Korea early in the campaign.

ADDRESSING newly commissioned R.A.F. officers at Cranwell on April 11th, Admiral of the Fleet Lord Fraser of North Cape delivered this resounding and forthright advice: "Uphold tradition, learn a language, see for yourselves, set your course right and never once let go." This visit to Cranwell by the First Sea Lord—a precedent in Service history—was made on the graduation day of the 52nd (General Duties Branch) and 3rd (Equipment and Secretarial) entries of officer cadets. In his address, Lord Fraser recalled that, in wartime, the R.A.F. had often come to the rescue of the Navy, who were most grateful.

After welcoming the First Lord, A. Cdre. G. L. Sinclair, the Commandant, reviewed the College's progress during the year. He was happy to report no slackening in the progressive rise in efficiency which had followed the College re-opening after the war. Standards of flying instruction, and of proficiency of pupils in all entries, had been rated above average by a recent C.F.S. examining team. When the College opened next term it would for the first time have a total of 300 G.D. cadets—which might later reach 400.

Prizes and awards, presented by Lord Fraser, were as follows: Sword of Honour, F/Cdt. U/Off. J. A. Fryer; King's Medal, Abdy Gerrard Fellowes Memorial Prize and R.U.S.I. Award, F/Cdt. Cpl. R. Hollingworth; Phillip Sassoon Prize, Dickson Trophy and John Anthony Chance Prize, F/Cdt. U/Off. M. Gill; R. M. Groves Prize, F/Cdt. R. L. Dimock; Air Ministry Prize for Imperial and War Studies, F/Cdt. U/Off. R. J. Littlejohn.

The Equipment and Secretarial awards were: Medal of Honour, F/Cdt. U/Off. J. A. Kiely; Air Ministry Prize for Equipment Studies, F/Cdt. Sgt. E. F. Banks; Air Ministry Prize for Secretarial Studies, F/Cdt. Sgt. V. J. W. M. Lawrence.

Australia's Citizen Air Force

WITH the formation of a new squadron—No. 5, at Mallala, Southern Australia—the Citizen Air Force of Australia, a body corresponding to our R.Aux.A.F., now has five fighter squadrons. All are equipped with Mustangs, though jet re-equipment will take place ultimately. They also have Tiger Moths and Wirraways for basic and advanced training. The other squadrons are based near Perth, Melbourne, Sydney and Brisbane, and there are seven country flights. No. 24 squadron was originally formed in June, 1940, and flew, successively, Wirraways, Hudsons, Vengeances and Liberators; it built up a fine war-record before it was eventually disbanded in July, 1946.

Film of "The Few"

AIR Ministry co-operation should ensure the authenticity and realism of *Angels One Five* (R/T. code for 15,000ft), a forthcoming film which will show the operational—and off-duty—activities of R.A.F. fighter-pilots during the Battle of Britain. The original story was written by W/C. A. J. C. Pelham-Groom, who was sector-controller at Biggin Hill in 1940; the producers, John Gossage and Derek Twist, both served in the R.A.F. during the war; George More O'Ferral, producer, was an Army liaison officer in Fighter Command Operations Room.

Production will begin next month by the Associated British Picture Corporation in collaboration with Templar Productions. Part of *Angels One Five* will be shot at R.A.F. Station Kenley, one of the busiest Battle of Britain fighter bases.

New Director of Manning

WITH the acting rank of Air Vice-Marshal, A. Cdre. N. S. Allinson, C.B., will take up a new appointment next May as Director-General of Manning at the Air Ministry. Since February, 1949, A. Cdre. Allinson has been A.O.C. Rhodesian Air Training Group. For two years after the war he was at the Air Ministry as Director of Operational Training.

A. Cdre. Allinson, who is 47, entered the R.A.F. in 1923 and was commissioned from Cranwell the following year. In the early part of the war he served in the Directorate of Armament Development at the Air Ministry and at the Ministry of Aircraft Production.

Mission from Shawbury

SEVEN specialists—six navigators and one traffic-controller—were due to leave the R.A.F. Central Navigation and Control School at Shawbury last Monday for a six-week 30,000-mile tour of Air Force stations in Australia and New Zealand. The team, headed by G/C. B. J. R. Roberts, Commandant of the School, is touring in a Handley Page Hastings flown by staff aircrew and carrying its own ground crew. F/L. J. W. Woods, D.F.C., a New Zealander, is

FIRST LORD'S INSPECTION: Accompanied by A. Cdre. Sinclair, Commandant of the R.A.F. College, Admiral of the Fleet Lord Fraser of North Cape inspects graduating cadets at Cranwell. He took the salute of 370 cadets.

SERVICE AVIATION . . .

captain. Members of the team include S/L. J. A. Jarvis, D.F.C., A.F.C., who commands the air-traffic controllers' course, and S/L. J. I. S. Digman, D.F.C., who is in charge of the specialist navigation course.

The object of the mission is to keep the R.A.A.F. and R.N.Z.A.F. abreast of navigational developments and to give the School's staff up-to-date experience of flying on Commonwealth trunk routes. Matters of mutual interest will be discussed.

The Hastings, flying *via* Luqa, Habbaniya, Karachi, Negombo and Changi, is expected to arrive in Darwin on April 22nd. The team will start work the next day.

R.A.F. Ball in Malta

GUESTS of honour at a private dance given on April 9th by A.V-M. N. H. deAeth, the A.O.C. Malta, and his officers were Princess Elizabeth and the Duke of Edinburgh. A.Cdre. E. H. Fielden, Captain of the King's Flight, was also present. The ball was given in the Phoenicia Hotel at Valletta; the ballroom was handsomely decorated with set-pieces designed by the R.A.F., including an English panorama with six Vampires against a sunset background. The Royal table was decorated by illuminated fountains.

To Command W.R.A.A.F.

THE appointment is announced of Miss Doris Carter as Director of the Women's Royal Australian Air Force, with the rank of Wing Officer. Miss Carter has until recently been in London senior officer of the child and youth migration section of the Australian Department of Immigration. Before returning to the Commonwealth to take up her new appointment, she will study the latest organizational developments in the W.R.A.F. in Britain. Miss Carter, who is 39, has had a distinguished athletic career. She represented Australia at the Olympic Games in 1936 and the Empire Games in 1938. From 1942-46 she served in the W.A.A.A.F., reaching the rank of Squadron Officer.

R.A.F.A. Conference

THE annual conference of the Royal Air Forces Association is to be held at Torquay from June 9-10th.

Memorial to Naval Pilot

RESIDENTS of Doncaster have contributed £291 for a memorial, which is to be installed in Doncaster parish church, to Lt. Keith Shepherd, R.N., who was killed last year while serving in H.M.S. *Implacable*. Lt. Shepherd, the son of a Doncaster surgeon, was the first pilot to fly a jet aircraft from a carrier inside the Arctic Circle—a Sea Vampire from H.M.S. *Vengeance* in 1949.

R.C.A.F. Buys Beechcrafts

FOR pilot and navigator training, and communications work, the R.C.A.F. has ordered a "substantial number" of Beechcraft D-18S trainers. First deliveries will begin in May. An up-to-date version of the Expediter, 7,000 of which were built during the war, the D-18S is powered by two 450-h.p. Pratt and Whitney radials, giving a top speed of 230 m.p.h. It carries up to nine persons and has a maximum range of 1,420 miles. Variants of the basic Expediter design are now serving in 17 different nations.

M.E.F. Modellers

THREE model aircraft clubs at R.A.F. stations in the Suez Canal Zone recently combined to hold a flying meet at R.A.F. Station Shallufa. The Shallufa, Kasfareet and Abyad station clubs took part and between them mustered some 60 models. A similar club is being formed at R.A.F. Station, Ismailia, and the four clubs are planning to hold a Middle East meet at Shallufa.

Formed in August, 1948, the Shallufa club has a membership of 20 and possesses some 44 motor-driven models. Its model-making facilities include a lathe, a buzz-saw and sanding machine and 16 working benches. Full-size boat building is also carried on by some members.

When the club opened, its activities mainly centred in rubber-driven models, but because climatic conditions in the Zone had an adverse affect on rubber the members converted to diesel-driven aircraft. Some have reached a considerable height, then drifted away over the city of Suez, in the Ataqa mountains lying behind Shallufa, or across the Suez Canal, resting finally in the Sinai Desert.

CRANWELL SCENE: As reported on the preceding page, Admiral of the Fleet Lord Fraser visited Cranwell last week. He is seen presenting the Sword of Honour to F/Cdt. U/Off. J. A. Fryer of the graduating 52nd entry (General Duties Branch).

BRIEFING is given in the makeshift Korean operations-room of No. 77 Squadron, R.A.A.F., by F/L. I. A. Lyons. Pilots attending are (left to right) S/L. Cresswell, the C.O., F/L. Max Scannell—an R.A.F. Meteor pilot "on loan" to 77 Squadron during its current conversion from Mustangs to Meteor 8s—and Sgt. Plt. Lamb.

Reconnaissance in Malaya

USING Mosquitoes and Spitfires, the photographic section at Kuala Lumpur has been playing an important part in operations against the Malayan bandits since July, 1948. Last year members of the section processed over 250,000 prints—for scrutiny by the interpretation unit at Malaya District H.Q. in the search for bandit hideouts or movements, for briefing of air and ground forces, and for checking the accuracy of local maps.

Recently the section provided an example of the value of photography in rescue work when a Dakota crashed in a remote and almost inaccessible area. A Spitfire photographed the whole of the country around the scene and flew back with the film in the late afternoon. By dawn of the next day, the photographic section, working in shifts, had produced over 800 prints. These were laid down in mosaic form and handed to the rescue party.

Reunion

IT is proposed to include former officers, R.A.F. and W.A.A.F., Dominion and Allied, of No. 29 Group in the 25-Group reunion held annually in February or March. Those interested are asked to write to A.V-M. E. D. Davis, C.B., O.B.E., Shell Mex House (R.449), Strand, London, W.C.2, marking envelope "29 Group."

* * *

No. 3 Squadron, R.A.F.—Officers' reunion dinner at the Savoy Hotel, London, on June 29th. Details from F/L. E. G. P. Jeffery, R.A.F. Gutersloh, B.A.F.O., B.A.O.R. 15, Germany.

No. 1 Temperature Measuring

The comprehensive range of Weston temperature measuring instruments covers the requirements of existing production aircraft, as well as types now under development. In addition to thermometry for the indication cylinder, air, oil and radiator temperatures, Weston equipment for aircraft includes instruments for power supply, navigational aid instruments, selector switches etc.

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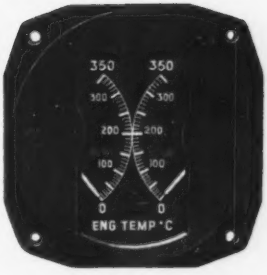

Illustrations show:

Above: Model 5128. Dual Engine Temperature Indicator, comprising two Millivoltmeters of 100° scale housed in large size S.A.E. case. For use in conjunction with copper/constantan, iron/constantan or chrome/alumel thermocouples.

Below: Model 5127. Dual Ratiometer Indicator, comprising two 100° Ratiometer movements housed in large-size S.A.E. case. For use in conjunction with thermometer bulbs, electrical oil pressure transmitters, electrical position indicators or any combination of two of these to indicate a variety of temperatures, pressures or position.

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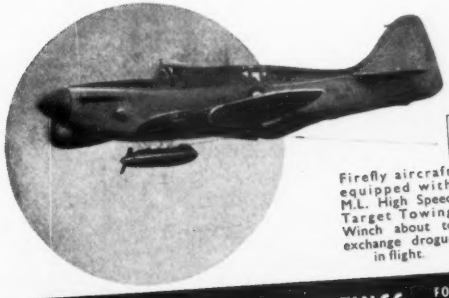

Firefly aircraft equipped with M.L. High Speed Target Towing Winch about to exchange drogue in flight.

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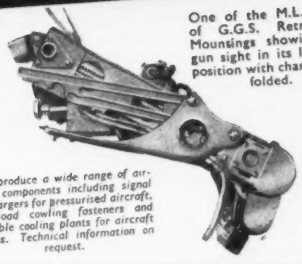

One of the M.L. range of G.G.S. Retractable Mountings showing the gun sight in its lowered position with chart board folded.

The M.L. Retractable Mounting for Gyro Gun Sights carries the gun sight clear of the pilot's vision for normal flight, take-off and landing. A single-control switch rapidly raises the sight for combat and again stows it after use.

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This belief in Faireys

Credulity has rarely been more strained than in this subject of aircraft performances. Reading about the versatility of the Fairey Firefly is reason enough for the strain until one has seen some of the performance and then doubts at once begin to dissolve and opposite reactions set in. One not only believes in Faireys but expects them to do even more than is claimed for them. Why can they not, at a mere word from the pilot, become invisible? At another word unfold their wings and take off from the carrier deck? Why should the makers think it unreasonable of pilots to expect perpetual and infinite faeriation?

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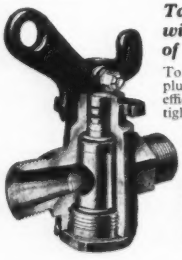

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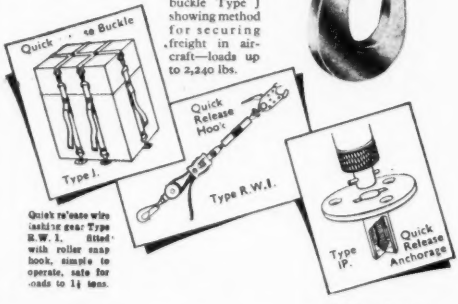

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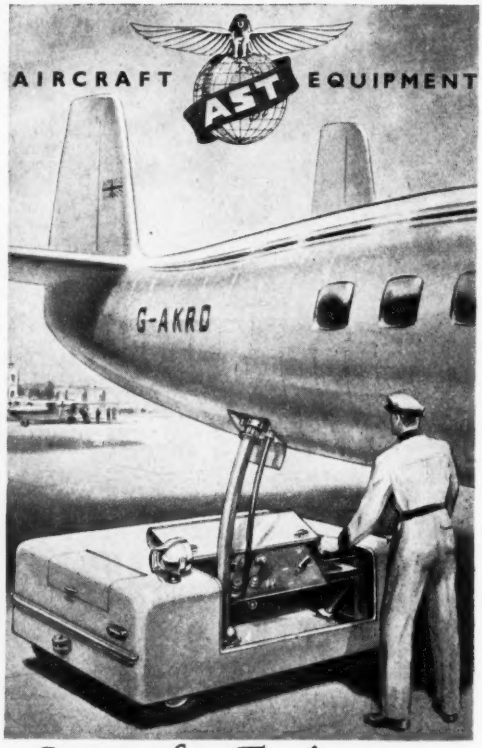

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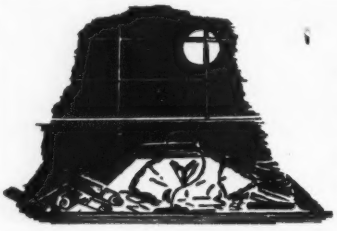

Our Chief Designer is a very nice chap

but we often feel he hides his light under a bushel because, practically regardless of the time of day or night, he is here at the factory and hard at work. This so impresses us that we feel we must tell you about it for you, after all, as users of our control equipment, must be very interested in the doings of our Chief Designer. One of these days we are going to check up on him to see whether he takes time off to sleep. Mind you, in spite of all this, he looks remarkably healthy, and we feel that with complete confidence we can invite you to pile more problems onto his shoulders.

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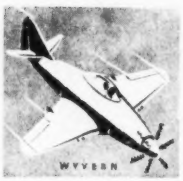

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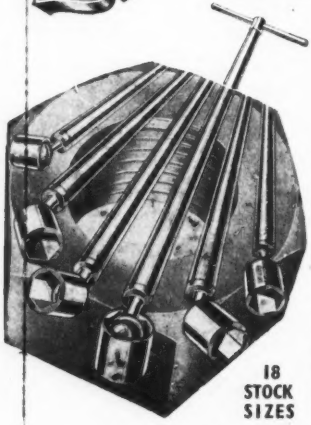

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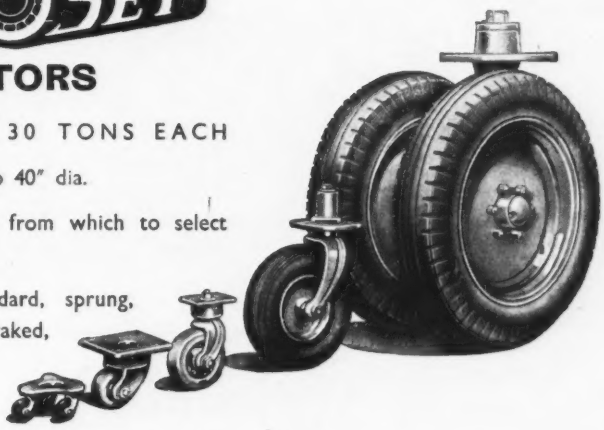

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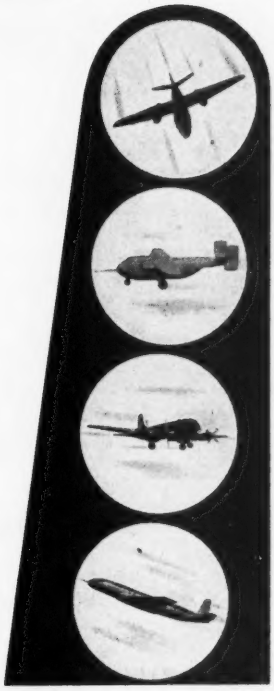

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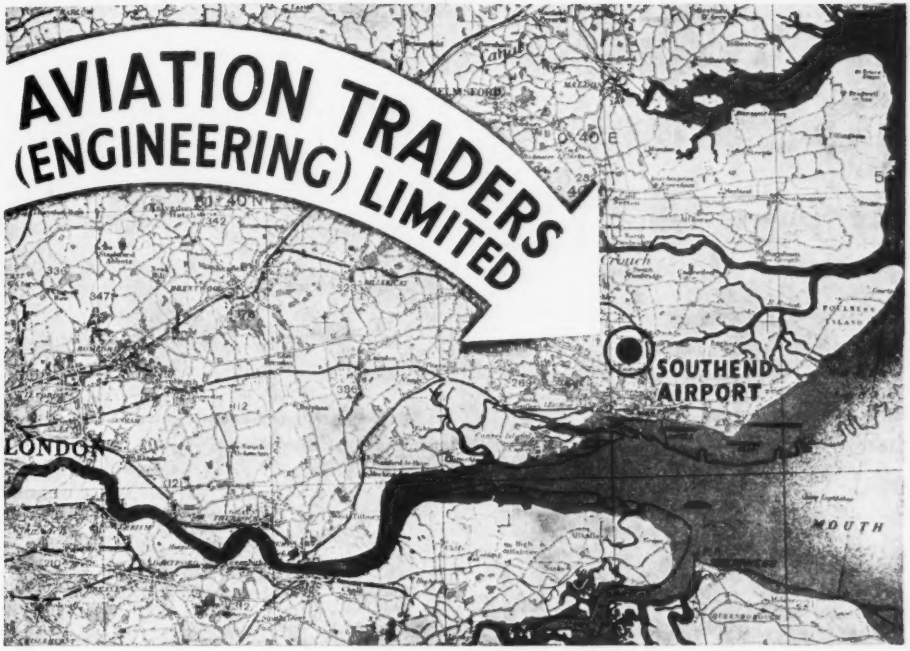

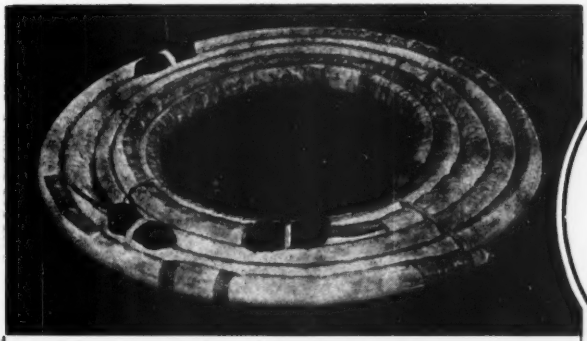

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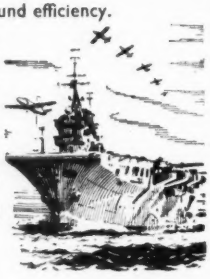

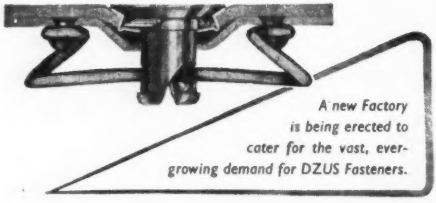

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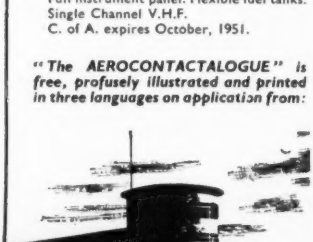

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AIRCRAFT stressmen required.—Write, stating qualifications and experience, to Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [6149

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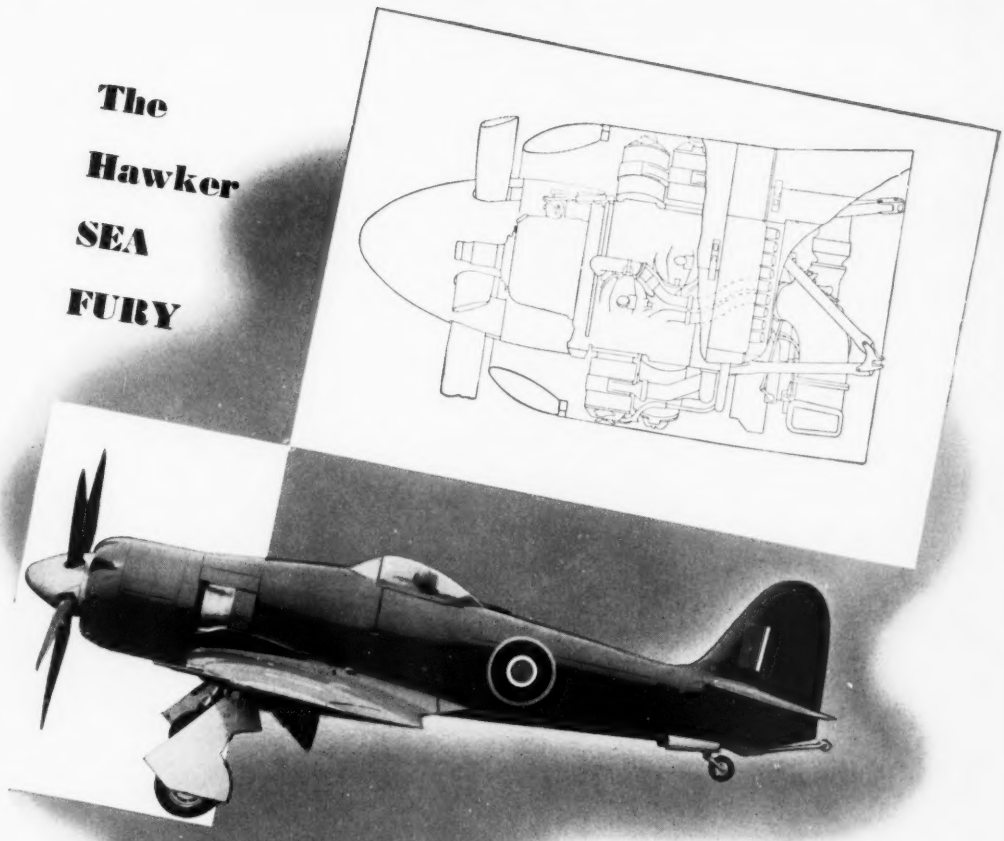

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